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Cost Benefit Analysis of Residential Insulation in Kosovo

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Cost Benefit Analysis of Residential Insulation in Kosovo

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ABBREVIATIONS

BCR – Benefit-Cost Ratio

CENR – RIT/A.U.K. Center for Energy and Natural Resources

EBRD – European Bank for Reconstruction and Development

EE – Energy Efficient

EU – European Union

IFC – International Finance Corporation

INDEP – Institute for Development Policy

IRR – Internal Rate of Return

KBRA – Kosovo Business Registration Agency

KOSEP – Kosovo Sustainable Energy Projects

KOSID – Kosovo Civil Society Consortium for Sustainable Development

NPV – Net Present Value

UK – The United Kingdom

U.S. – The United States

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EXECUTIVE SUMMARY

This project provides a cost benefit analysis of residential insulation investments in Kosovo households, as the cheapest and the most effective way of improving residential energy efficiency. Space heating represents the largest share of the total energy consumption in households, with biomass and electricity being the main sources of energy. Kosovo is currently dealing with issues of deforestation, while the electricity demand is not being fulfilled by the domestic power generation. This situation calls for the introduction of energy efficiency measures, especially residential insulation in households. Residential insulation can play a significant role in cutting down on the consumption of fire wood; thereby, preventing deforestation; and minimizing the volume of electricity imports; thereby, reducing the need for government subsidies in the electricity sector.

One of the goals of this project was to find out the costs related to insulating a home, and applying these costs to an average Kosovar household of generic characteristics. Another objective of this project was to calculate the net present value of insulation investments, its internal rate of return, the payback period, and the cost benefit ratio, as measures of project worth. Several sensitivity analyses considering different house sizes, wall insulation thicknesses, and types of energy efficient windows were conducted. The analysis proved that residential insulation is a wise investment. It has a payback period of 7 years for an average household with average characteristics, and around €4,000 worth of decreased energy spending during 18 years.

The Government of Kosovo should provide subsidies for building efficiency improvements. Local manufacturers of energy efficient products suggest that subventions in the form of machinery would ensure their businesses to continue operating in the marketplace. Commercial banks in Kosovo should consider providing longer “grace periods” in repaying eco-loans. The Government should raise awareness about the many benefits of residential insulation, and should consider exempting energy efficiency products from taxes.

1. INTRODUCTION

The building sector, which consists of the residential and services, accounts for 48% of the energy consumption in Kosovo annually (World Bank Institute, 2013). The residential sector also represents the largest share of Kosovo's final energy consumption, with biomass and electricity being the main fuels utilized (World Bank Institute, 2013). Since space heating has the major share (80%) of the total energy consumption in households in Kosovo (Bowen et al. 2013), most energy saving potential is associated with thermal insulation and heat loss reduction. More than 50% of the Kosovo building stock was constructed in the period 1970 to 1985. This situation is reflected in the comparatively high heat consumption of these buildings. According to the World Bank, the consumption in Kosovo is estimated to be approximately 219 kWh/m^2 annually, as opposed to 80–150 kWh/m^2 annually in Western Europe (2013). This indicates that there is a considerable opportunity for energy efficiency improvements in Kosovo's building stock. This endeavor would generate annual cost savings to both investors and end-users of about €198 million (World Bank, 2013).

The electricity demand in Kosovo is not being fulfilled by the domestic power generation. The shortfall of electricity is partially met by energy imports, 50% of which were funded with grants from the Government of Kosovo (World Bank Institute, 2013). Government subsidies to the electricity sector amounted to around €460 million between 2007 and 2011.

The system is kept in balance through load shedding (World Bank Institute, 2013). Demand is currently anticipated to increase to 2,000 MW by year 2028. The import costs are predicted to be in the range of €200-400 million per year by 2017 (or 13 to 26% of the 2011 national budget) (World Bank Institute, 2013).

The introduction of energy efficiency measures, especially residential insulation, can play a significant role in cutting down on the consumption of fire wood; thereby, preventing deforestation; and minimizing the volume of electricity imports; thereby, reducing the need for government subsidies.

The main way to decrease energy consumption – hence, decrease households' energy costs – is by insulating homes. One of the objectives of this project is to find out the costs related to

insulating a home. These calculations were done by figuring out insulation prices through market research, and then applying these costs to an average Kosovar household of generic characteristics.

The next goal of this project was to conduct a cost-benefit analysis of housing insulation cost and long-term savings on energy, through heat loss calculations. The United States Department of Energy claims that an insulation upgrade has one of the highest returns on investment (2012), and this will be tested in this project.

Another objective of this project was to calculate the net present value of the investment in regards to insulation, its internal rate of return, and the payback period. Due to the high initial investment to insulate a house, many citizens are reluctant to undergo such an action. Therefore, calculating the internal rate of return for their investment would act as a piece of information against which they can measure their willingness to invest in this aspect.

Sensitivity analyses took in consideration the average of the smallest surface area houses in the household size spectrum; the average of the largest surface area houses; different wall insulation thicknesses; and households using exclusively wood or electricity as their source of energy. These differentiations from the average household further illustrated the impact of residential insulation. A few of these various scenarios are discussed throughout the paper, while the rest can be found in the appendix.

2. ENERGY EFFICIENCY AROUND THE WORLD

2.1 Residential Energy Efficiency

Energy efficiency is a method of reducing individual energy consumption and potentially decreasing the amount spent on energy resources. Energy efficiency is the case when a system can deliver additional services for the same energy input, or alternatively the same services for less energy (International Energy Agency, 2014). The efficient use of energy is commonly considered to be vital to managing a county's resources sustainably. Consequently, improving energy efficiency is a priority, and development of new energy efficiency technologies and methodologies for saving energy has been occurring (Hatakka et al., 2012).

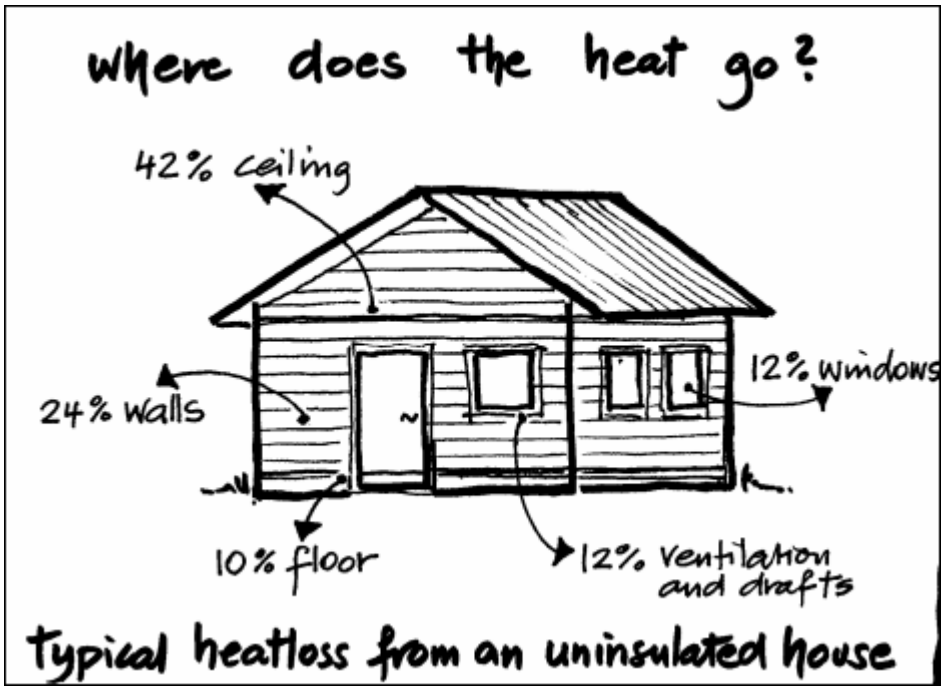
In terms of how energy is used and where savings can be made, residential energy is mainly used for cooking, heating, and cooling. These three aspects account for about a quarter of the total energy usage in the European Union (Olaniyan and Evans, 2013). In the United States, space heating and cooling makes up 44% of the power bill, while in New Zealand, 34% (Waitakere City Council, 2013).

In areas where there are more heating degree days, individuals are in particular concerned in ensuring a reliable supply at a minimum price. Households may also be keen to evade energy poverty and contribute towards the reduction of CO_2 emissions. In order to do this, households are increasingly altering their lifestyle and behavior so as to manage their energy consumption better (Olaniyan and Evans, 2013).

There are many methods in which households can save energy, but insulation is considered the most effective mode of doing so. Insulation is a barrier to heat dissipation and stabilizing temperature by reducing the amount of energy escaping the house in winter, and reduces the amount of heat entering in summer. By correctly insulating ceilings, walls and under the floors, one can successfully reduce heating and cooling costs by around 50% (Fletcher Insulation, 2013). Insulation starts working once it is installed. It tends to last as long as the building, and, unless impaired or damaged, requires no maintenance (North American Insulation Manufacturers Association, 2013).

The United States Department of Energy (2012) claims that an insulation upgrade has one of the highest returns on investment. According to the North American Insulation Manufacturers Association (2013), insulation tends to save around 600 times more energy annually than the compact fluorescent lights (CFLs), Energy Star windows, and Energy Star Appliances combined.

Figure 2.1 Typical Heat Loss from an Uninsulated Home



Source: Waitakere City Council, 2013

As can be noticed from Figure 2.1, the main loss of heat is claimed to be through the ceiling (approximately 40%). Walls also tend to lose a substantial amount of heat, but it is difficult to retrofit without removing the walls' internal lining. Floors are cheap and easy to insulate, while the windows are considered the biggest heat drain when considering their area (Waitakere City Council, 2013).

Facing challenges such as rising energy prices, dependency from Russia on energy imports, and concerns on global warming, Eastern and Central-European countries have still not completely coped with the aftermath of this transition period and their socialist heritage. Numerous houses are still inadequately insulated and continue to waste huge amounts of energy (Intelligent Energy Europe Programme of the European Commission, 2010). According to the Consumer Price Index (2009), it is not only Europe that has been greatly affected by these increased energy prices. Over

the past two decades, nationwide electricity rates in the United States have increased annually by 2%, while natural gas rates have risen by 3.5% annually.

2.2 Economic Feasibility of Insulation in Households: The United States

There is much to learn on energy efficiency from the United States (U.S.) – a country with strict national "green" building standards. An energy efficiency study was performed in the Southwest region of the U.S. to calculate the cost-benefit data needed (Sadineni et al., 2010). The data was utilized by a local electric utility in order to define a rebate program with the purpose of encouraging energy efficient construction in this particular region. Numerous efficiency upgrades for households were identified, and then a thorough evaluation of every building component was tested through the building energy simulation software. The validated building models served in predicting payback periods for each upgrade and annual energy savings. In all of the cases, the building models were compared with code-built houses which have the same overall characteristics (Sadineni et al., 2010). Figure 2.2 illustrates the costs and benefits of the applied energy efficiency upgrades.

Figure 2.2 Costs and Benefits of Applied Energy Efficiency Upgrades

Energy efficiency component	Additional cost/ initial investment ($)	Total annual savings ($)	Life span (years)	Present value ($)	Benefit/cost
Walls	750	92	40	1721	2.3
Windows	300	82	40	1895	6.3
Doors	120	37	40	867	7.2
Infiltration (cellulose insulation in walls and roof)	650	521	40	13327	20.5
HVAC (AC Unit)	700	90	20	735	1.0
Lighting	200	59	15	535	2.7

Source: Sadineni et al., 2012

One of the main findings of this study is that the useful life of the majority of these efficiency upgrades far exceeds their respective payback periods. The study showed a typical house, with these cost-effective upgrades installed, in the end consumed 42.5% less energy annually in comparison to a house not built to code.

2.3 Retrofit Challenge & The Green Deal: The United Kingdom

Similar to Kosovo, the United Kingdom (UK) is facing a challenge to retrofit its existing housing stock. The thermal performance of these households in the UK must improve considerably for the country to meet its objective to reduce the CO_2 emissions by 80%, compared to the 1990 baseline, by the year 2050 (Dowson et al., 2012). Twenty-six million households in the UK were assessed to be responsible for a total of 27% of all UK emissions of CO_2. The fact that 75-80% of the existing UK buildings are going to still be in use by 2050 is a major concern. Millions of these buildings have single-glazed windows, uninsulated floors, walls, and roofs responsible for a considerable amount of heat loss (Dowson et al., 2012).

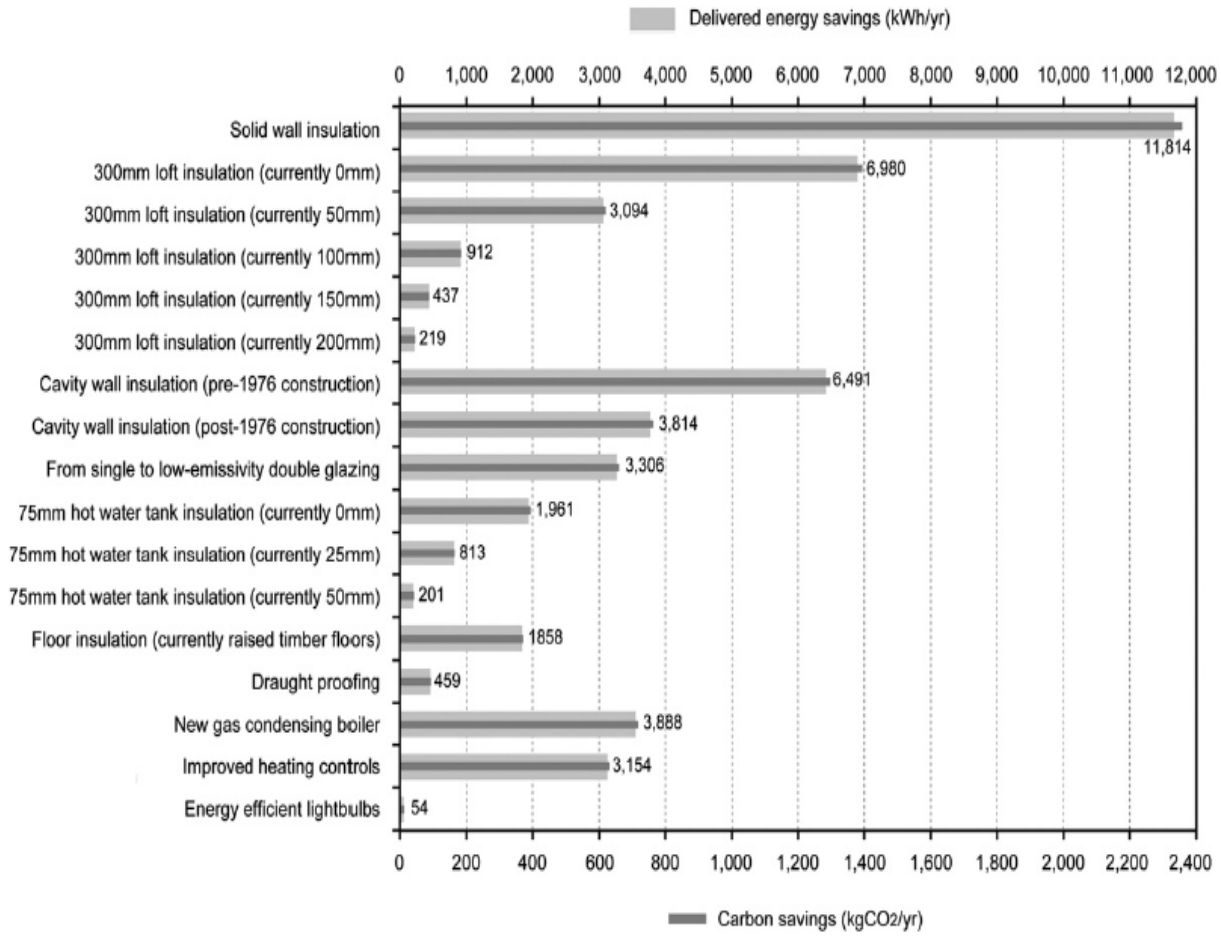
As a result, the government of the UK launched the Green Deal Home Improvement Scheme in October, 2012. From this time on, the Green Deal turned into a key mechanism for energy efficiency improvements in the UK's domestic buildings. Through this program, home owners have the opportunity to obtain home improvements in regards to energy efficiency without paying the upfront costs of the refurbishment. As an alternative, capital is financed privately through consortia composed of local authorities, business and consumer groups, investor community, and banks, who recover their investment through a charge on the energy bill of each customer (UK Government, 2012).

The Green Deal's aim is to encourage households to take out loans in order to fund the expenses of work, like installing insulation, with the loans being paid back to the government in instalments on their respective energy bills. The Green Deal helps the UK citizens to make energy-saving improvements to their homes while paying for them gradually. Typical examples of improvements applied in homes, which could save households a great amount of energy, include: insulation, draught-proofing, heating, renewable energy generation, and double glazing (UK Government, 2012).

Continuing to focus on UK housing stock, Shorrock et al. (2005) has published a study analyzing CO2 reductions' scope in respect to households in the UK. Focusing on measures pertaining to insulation for a typical three-bedroom, semi-detached house, CO_2, energy, and cost savings were

calculated through the BREDEM energy model. Figure 2.3 shows the annual CO_2 and energy savings from these retrofit measures.

Figure 2.3 Carbon and Energy Savings from Retrofit Measures



Source: Shorrock et al., 2012

Some measures applied prove to be considerably more beneficial than others. Larger savings can be experienced in the case when a solid wall is insulated, as opposed to a cavity one. Additionally, energy savings were significantly higher if the retrofit measures were being applied for the first time; thus, predicted savings from insulation provide diminishing returns based on how much insulation was already present. In the case of existing insulation levels of 50 mm and up, the savings become relatively small, up to the point they are not worthwhile.

2.4 Passivhaus Refurbishment: Germany

Germany is one of the European countries truly aware of the importance of building standards. A large amount of information and experience on household energy efficiency is available in the German retrofit market because of their implementation of the so-called Passivhaus standard in new and existing homes (Dowson et al., 2012). The main principles of a Passivhaus depend on the design of super insulation and airtight fabric, in combination with what is called a "whole house mechanical ventilation with heat recovery" (WHMVHR). With this approach, households have minimal heat losses, while constantly being supplied with fresh air – regulated humidity and no draughts (Dowson et al., 2012).

A typical example of a Passivhaus retrofit project would be the "Zukunft Haus Pilot Programme," where 915 houses were renovated in both Eastern and Western Germany. These homes were equipped with high levels of wall insulation, triple glazing, and efficient energy systems, among others. Consequently, an 80% decrease in energy consumption was achieved throughout the households, resulting to these standards being twice as effective as the building standards in Germany at the time (Dowson et al., 2012).

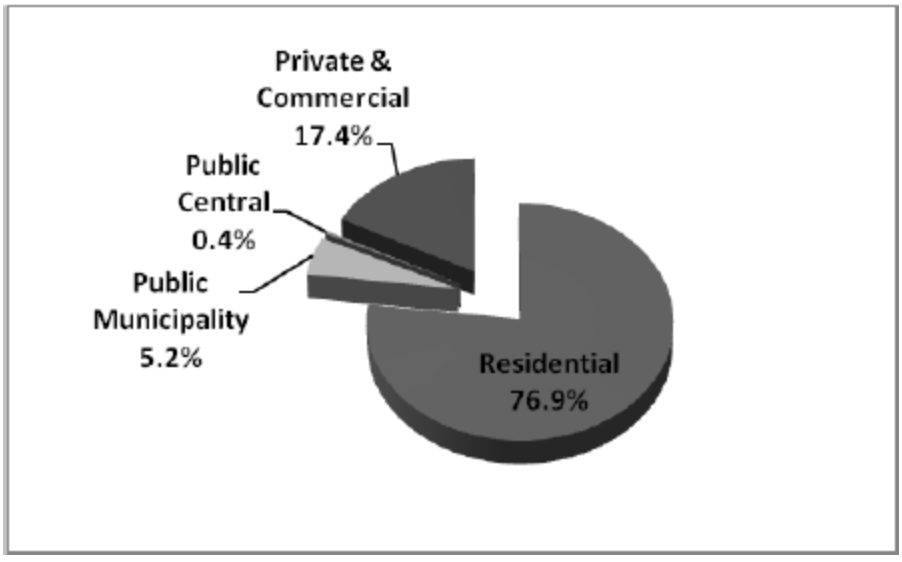
3. ENERGY EFFICIENCY IN KOSOVO

3.1 Energy Savings' Potential in the Residential Sector

The building sector, consisting of the Residential and Services Sectors (both public and private), accounts for 48% of the energy consumption (World Bank Institute, 2013). This sector also represents the largest share of Kosovo's final energy consumption. Biomass and electricity are the main fuels used by the Residential Sector (World Bank Institute, 2013).

The total floor area of the building stock in Kosovo is assessed to be 45 million m^2 (World Bank Institute, 2013). Around a third of the building stock is accounted for one-story residential buildings. The residential building sector has a total floor area of around 35 million m^2, followed by the private building sector with approximately 8 million m^2. Public buildings have a total floor area of just over 2 million m^2. Figure 3.1 illustrates each building sector's share of the total floor area.

Figure 3.1 Floor Area by Building Sector



Source: World Bank Institute, 2013

The overall savings potential of the building sector in Kosovo is almost 11% of primary energy supply, almost 8% of which being from the residential sector (World Bank Institute, 2013). Total

energy savings for the entire building stock are around 45% of the total energy consumption of both the household and service sectors (World Bank Institute, 2013).

Table 3.1 Energy Savings Potential by Building Category

Building Sector	Building Sector Total Area [million m²]	Building Sector Total Area [%]	Energy Savings Potential of Building Sector as % of Final Energy Consumpt.	Energy Savings Potential of Building Sector as % of Primary Energy Supply	Total Energy Savings Potential [ktoe]	Total CO_2 Reduction Potential [thousand ton/year]
I. Residential	**34.72**	**76.9%**	**45%**	**7.86%**	**171.74**	**2236.76**
II. Public Municipality	**2.36**	**5.2%**	**32%**	**0.77%**	**16.77**	**35.96**
Schools	1.69	3.7%	37%	0.50%	10.90	23.37
Health Buildings	0.39	0.9%	37%	0.15%	3.35	7.18
Other Buildings	0.28	0.6%	30%	0.11%	2.52	5.40
II. Public Central	**0.18**	**0.4%**	**49%**	**0.16%**	**3.60**	**10.28**
Central Hospitals	0.05	0.1%	45%	0.05%	1.12	3.20
Central Government	0.14	0.3%	50%	0.11%	2.49	7.08
II. Private & Commercial	**7.86**	**17.4%**	**46%**	**2.15%**	**46.95**	**102.04**
TOTAL	**45.12**	**100.0%**	**20.07%**	**10.94%**	**239.05**	**2385.03**

Source: World Bank Institute, 2013

By realizing the energy efficiency potential in the building sector as presented in Table 3.1, Kosovo can save coal, oil by-products, wood, electricity, and heat. The monetary value of these energy savings is presented in the Table 3.2. These energy savings would not benefit only the building sector, but help the economy as a whole. Apart from energy savings, there is a huge potential of CO_2 reduction of over 20,000 tons annually.

Table 3.2 Monetary Value of Energy Savings

Energy Commodity	Residential Buildings			Public and Private Service			TOTAL
	Energy price €/kWh	Energy saving GWh	Energy saving value € m.	Energy price €/kWh	Energy saving GWh	Energy saving value € m.	Energy saving value € m.
Coal	0.0114	45.03	0.51	0.0126	36.27	0.45	0.97
Oil by-products	0.1251	188.89	23.64	0.1126	221.93	25.00	48.64
Fire wood	0.0307	587.28	18.03	0.0307	299.81	9.20	27.24
Electricity	0.0802	1142.0	91.63	0.1298	202.72	26.31	117.94
Heat	0.0542	34.12	1.85	0.0597	22.19	1.32	3.17
TOTAL			**135.68**			**62.30**	**197.99**

Source: World Bank Institute, 2013

Hence, a significant level of potential energy savings could be achieved by implementing energy efficiency measures in Kosovo's building stock. This endeavor would generate annual cost savings to both investors and end-users of about €198 million. As a result, these savings would cover the cost of the measures within 7 years, as it can be observed on the Table 3.3.

Table 3.3 Total and Specific Investments and Payback Period for all Cost Effective Measures, for each Sector

Building Sector	Building Sector Total Area [million m²]	Total Investment for cost effective EE Measures (€ m.)	Penetration ratio for building stock where EE/RES measures will be implemented in 2020	Total Specific Investment (€/m²)	Weighted Average Sectoral Pay Back Period (Years)
I. Residential	34.72	1124	46.10%	71.35	8.2
II. a Public Municipality	2.36	61	41.78%	62.55	4.00
Schools	1.69	47		66.59	4.66
Health Buildings	0.39	9		54.56	2.92
Other Buildings	0.28	5		49.19	2.41
II.b Public Central	0.18	18	86.68%	111.75	5.30
Central Hospitals	0.05	4		103.33	3.99
Central Government	0.14	14		114.60	5.87
II. c Private & Commercial	7.86	175	52%	42.80	3.73
TOTAL	45.12	1378	46.51%	58.75	6.96

3.2 Residential insulation and space heating

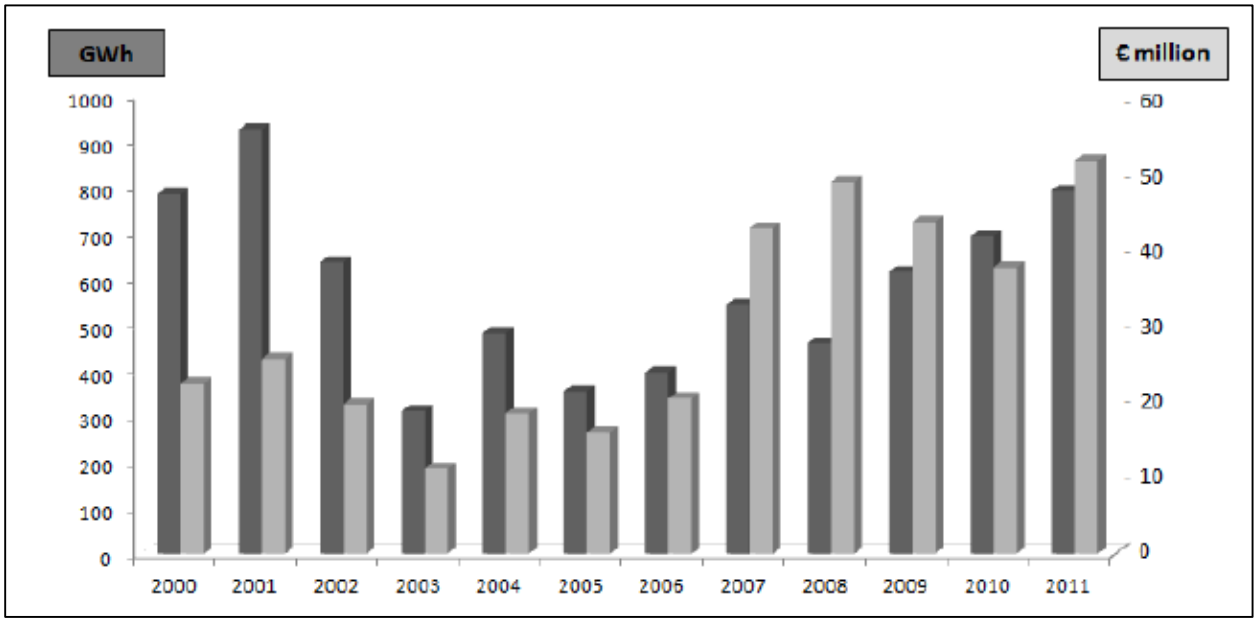
Since space heating has the major share (80%) of the total energy consumption in households in Kosovo (Bowen et al. 2013), most energy saving potential is associated with thermal insulation and heat loss reduction.

More than 50% of the Kosovo building stock was constructed in the period 1970 to 1985. This situation is reflected in the comparatively high heat consumption of these buildings. According to the World Bank Institute, the consumption in Kosovo is estimated to be approximately 219 kWh/m^2 annually, as opposed to 80–150 kWh/m^2 annually in Western Europe. This indicates that there is a considerable opportunity for energy efficiency improvements (2013).

Economic growth necessitates for reliable electricity supply. After the 1999 conflict, the electricity demand in Kosovo has not been fulfilled by the domestic power generation. Consequently, planned load shedding as according to predetermined schemes has been carried out due to the transmission network's limitation in capacity during demand peak hours (Ministry of European Integration, 2012).

In 2012, Kosovo had available about 800 MW of dependable operating generation capacity (World Bank Institute, 2013). Nonetheless, in 2011, the peak demand was 1,150 MW (Figure 3.2). The shortfall was partially met by energy imports (€55 million in 2011), 50% of which were funded with grants from the Government of Kosovo (€27 million). The system was kept in balance through load shedding (World Bank Institute, 2013). Demand is currently anticipated to increase to 2,000 MW by year 2028. The import costs are predicted to be in the range of €200-400 million per year by 2017 (or 13 to 26% of the 2011 national budget) (World Bank Institute, 2013). Potential savings in electricity consumption indicate an energy reduction potential of about 11%, representing an import reduction of 44%.

Figure 3.2 Figure: Volume (GWh) and Cost (€ million) of KEK Power Imports, 2000 - 2011

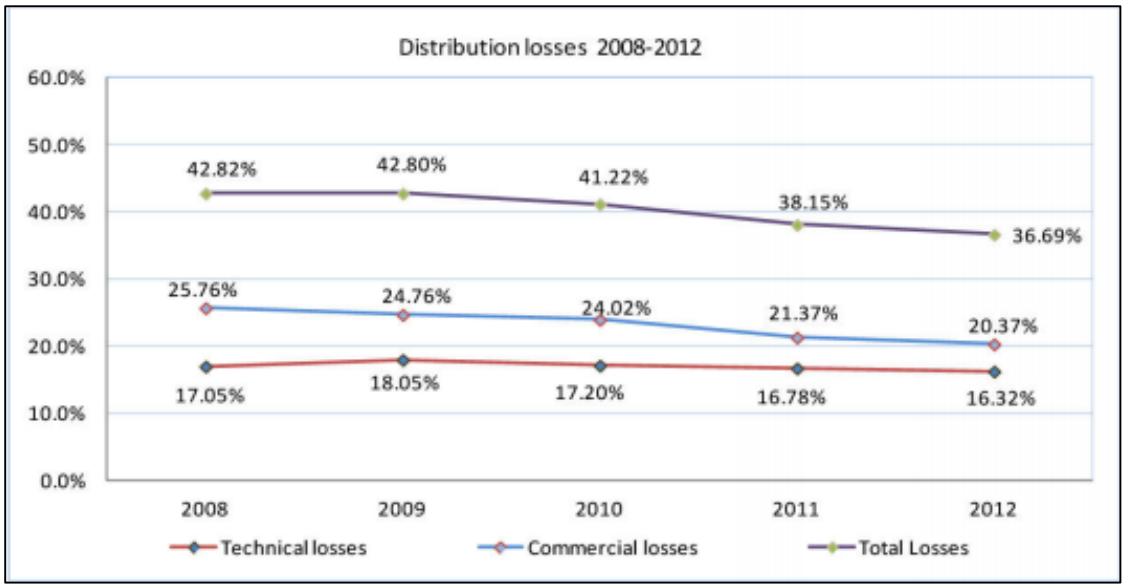


Source: World Bank Institute, 2013

According to the World Bank, despite the consistent imports, Kosovo is faced with persistent power shortages, as well as an unreliable electricity supply. Technical electricity losses are accounted to be around 17% and commercial losses around 24% (2013). Even though these losses are slowly decreasing, the numbers are still too high having in consideration that the ideal technical and commercial losses are set to be 8% and 5%, respectively.

Figure 3.3 presents the distribution losses from 2008 to 2012, as one of the factors leading to power shortages and outages in generation, constantly hurting the households and the economy of the country.

Figure 3.3 Distribution Losses 2008 - 2012



Source: Energy Regulatory Office, 2013

Ninety-eight percent of electricity generated in Kosovo comes from two highly-polluting and inefficient power plants (World Bank, 2013). In fact, the Kosovo A plant – the second biggest power plant in Kosovo – has been shut down for an indefinite period of time as of June 2014, following a huge explosion that has killed two people and damaged the houses nearby (Al Jazeera, 2014).

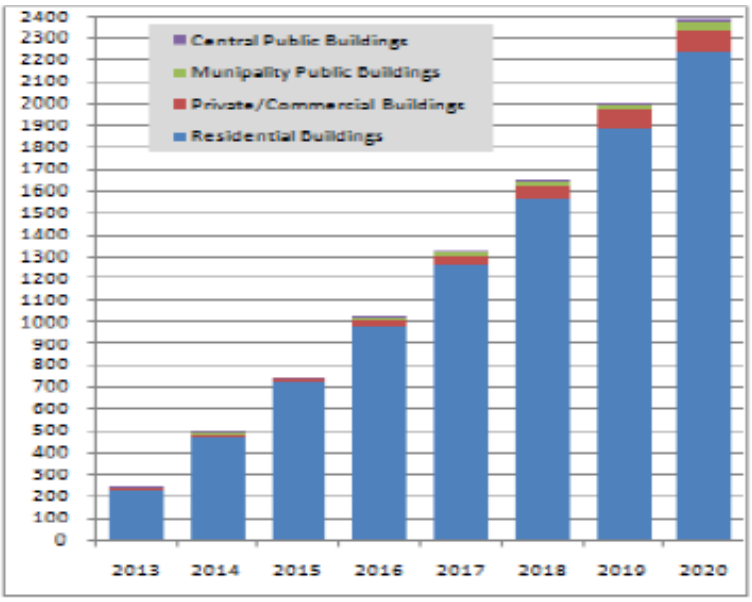
As previously stated, a secure energy supply is crucial to nourishing economic growth. At the moment, the Balkans heavily relies on imported hydrocarbons which are known to maintain high

intensity of energy in relation to GDP. This situation seems to be a burden on companies that need reliable infrastructure services, and households that spend a big portion of their income specifically for energy services. This portion of income dedicated to the electricity bill would decrease considerably with the introduction of insulation in households.

3.3 Benefits of Household Energy Efficiency

Due to geopolitical and economic problems, Kosovo is placed among the last countries of the region in the list of those concerned with energy efficiency (INDEP, 2012). However, energy efficiency in Kosovo must be considered a central issue subject to governmental efforts. Importantly enough, according to the International Finance Corporation (2014), Kosovo's energy intensity is stated to be the highest in the entire region, after Bulgaria. Thus, one of the purposes of an energy efficient action from the government would be to reach the CO_2 emission reduction target by reducing the demand for energy. With households producing a quarter of carbon emissions (UK Government, 2012), reducing their carbon footprint has become a responsibility for houses and a priority for governments. The introduction of energy efficiency measures for all energy services in the residential sector is to bring a CO_2 reduction of around 2.385 million tons per year in year 2020, as can be seen in Figure 3.4 (World Bank Institute, 2013).

Figure 3.4 Cumulative CO2 Reduction Potential for the Whole Building Stock



Having two old, inefficient, and highly polluting power plants for power generation, this step seems to be more than necessary. Another purpose for investing in this subject matter would be the fact that these investments would be closely related to both economic and social development trends. Possible benefits of residential energy efficiency suggest a long list, including the economic growth, job generation, and increased living standard.

Improving economic growth, the increased demand for insulating products in the domestic market would lead to a potential economic growth. Assuming that policies would favor domestic producers of residential insulation, businesses would profit because of the increased demand of their products.

Job generation, investments generally bring forth the need for human capital. Since insulation is being discussed, the construction sector in Kosovo would greatly benefit from this endeavor. The providers of the goods (insulation, double glazed windows) and services (installation of these goods) would be more active serving the interested parties. Also, people would spend less on energy bills, which could lead to a demand for other products that were previously unaffordable.

Generating new jobs and an increasing the amount of available income due to less energy bills would additionally affect the quality of life of the citizens.

3.4 Kosovo's Potential and Solutions

According to IFC, basic information about the residential sector would cover:

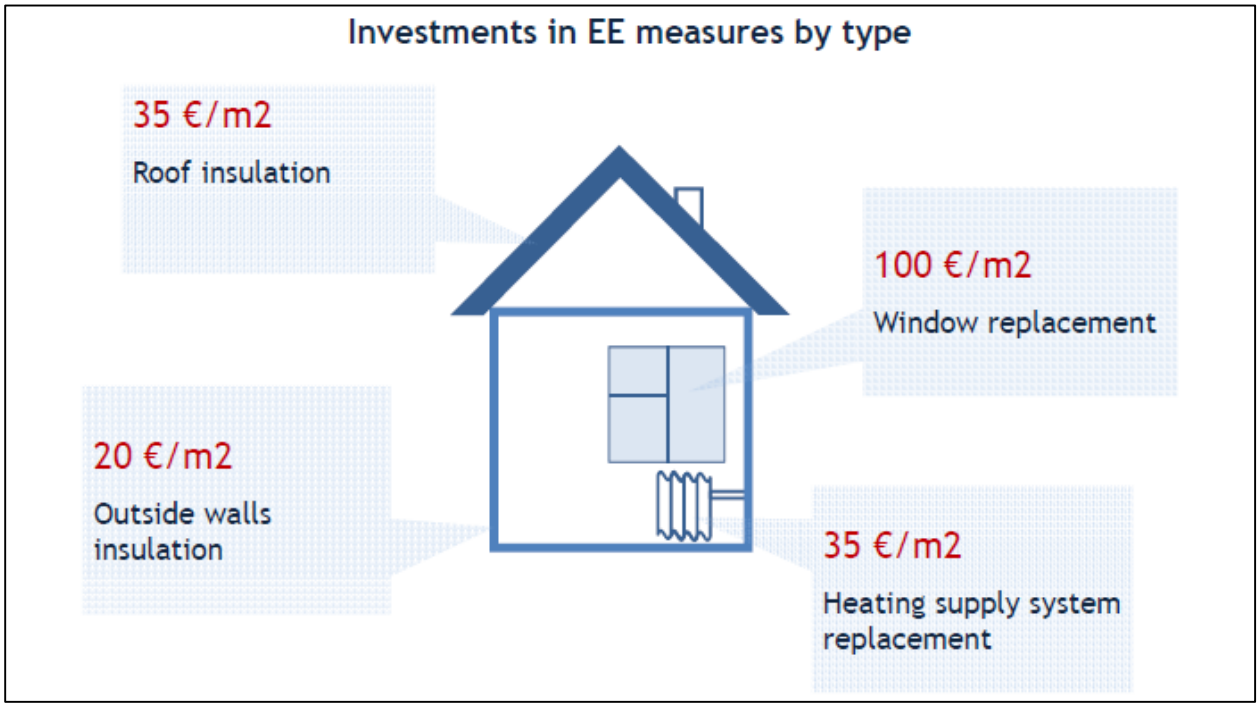
- 37 million m^2 – residential floor area of the building stock

Residential energy efficiency (EE) potential would include:

- €1.12 bn – estimate investments for EE of Residential sector
- 46.1% – energy saving potential of Residential sector
- 5.85 years – average payback period for Residential EE investments
- One-story houses – focus subcategory for banks with the biggest amount of investments needed (€460 million)

A solution for EE in Kosovo residential sector is considered to be mainly insulation. Figure 3.5 contains the prices for each insulation type derived from IFC market research in Kosovo.

Figure 3.5 Investments in Energy Efficiency Measures by Type



Source: International Finance Corporation, 2014, Kosovo

3.5 A Call for Residential Insulation

Figures 3.6 and 3.7 illustrate that the residential sector has the largest investment need. The cumulative total required by year 2020 is roughly €1.12 billion (World Bank Institute, 2013). The residential sector is followed by the private and commercial buildings, which are followed by municipal public buildings, and central public buildings, with investment requirements of €175 million, €62 million, and €18 million, respectively (World Bank Institute, 2013).

Figure 3.6 Annual Energy Efficiency Investments in each Sector (€ million)

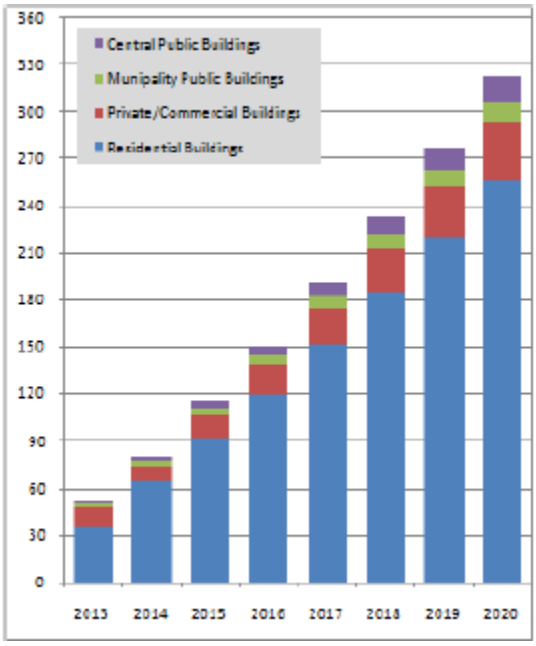
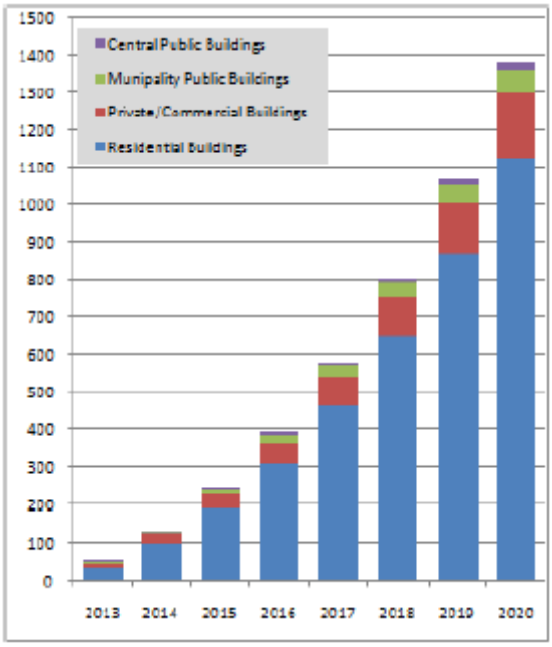


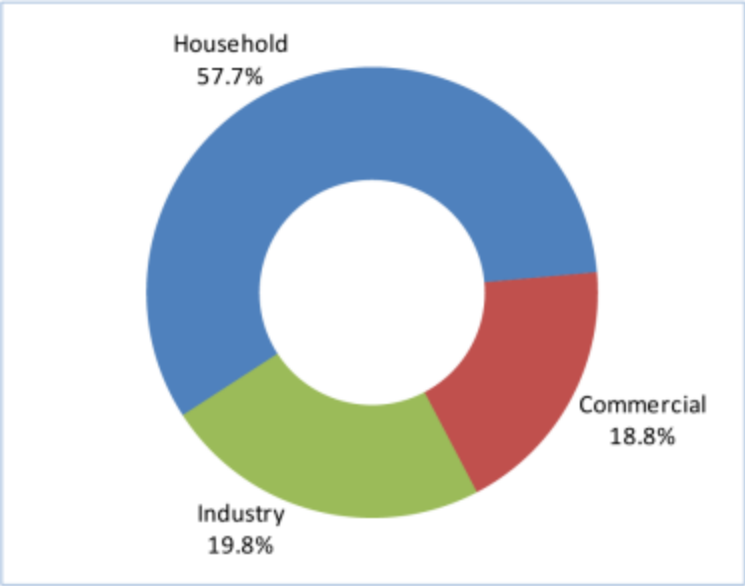
Figure 3.7 Cumulative Energy Efficiency Investments in each Sector (€ million)



The increased demand for electricity calls for energy efficient ways to keep the demand down. As the household sector has the highest share in total consumption distribution – 57%, – it would be wise if attention is to be focused on this very sector. Figure 3.8 illustrates the share of energy

consumption categories in distribution, with the industry category being the second one, while the commercial the third.

Figure 3.8 Total Energy Consumption Distribution in Kosovo



Source: Energy Regulatory Office, 2013

As insulation is the cheapest and the most effective way of improving the residential energy efficiency, then it is suggested that endeavors be focused on this matter.

According to a wood fuel study by the RIT/A.U.K. Center for Energy and Natural Resources (CENR), when asked about the insulation of their household, survey respondents indicated that more than 50% respondents had at least double glazed windows. Roof and wall insulation was less common with 34 and 31 percent respectively responding in positive. Of the households surveyed (1160), 221 had implemented all three of the different types of insulation practices surveyed; 31 had insulated just their walls and roof; 65 had insulated just their windows and their walls; and 74 had insulated just a combination of their roof and windows. This information can be seen in the Figure 3.9.

Figure 3.9 Residential Insulation in Kosovo

	Yes	No	Partly
Does your residential building have windows with double glazing?	640	520	
Does your residential building have roof insulation?	393	688	79
Does your residential building have wall insulation?	369	612	179

Source: RIT/A.U.K. Center for Energy and Natural Resources (CENR), 2014

Hence, in order to improve energy efficiency in Kosovar households, close attention needs to be paid to insulation installation as the main way to improve energy efficiency in houses, as the existing insulation measures are not sufficiently applied among Kosovar homes. As a matter of fact, there is a decreasing participation of the residential sector's energy efficient measures, as shown in Figure 3.10.

Figure 3.10 Participation of Residential Sector's Energy Efficient Measures

Sectors Sektorët	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Residential Amvisëri	32.8%	32.0%	30.9%	30.6%	30.3%	30.0%	29.8%	29.6%	29.4%	29.2%
Services Shërbime	12.0%	11.7%	11.2%	10.9%	10.7%	10.5%	10.4%	10.2%	10.0%	9.8%
Industri Industri	25.6%	26.9%	29.0%	29.6%	30.0%	30.5%	30.6%	30.9%	31.2%	31.5%
Transport Transport	25.0%	24.9%	24.4%	24.3%	24.4%	24.4%	24.5%	24.6%	24.7%	24.8%
Agriculture Bujqësi	4.6%	4.7%	4.6%	4.6%	4.6%	4.6%	4.7%	4.7%	4.7%	4.7%
Total Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Kosovo Energy Efficiency Agency, 2013

Hence, actions must be taken to increase energy efficiency in the household sector, as it has the highest share in total energy consumption distribution in Kosovo (INDEP, 2012). According to the International Finance Corporation, 79% of household buildings are over 20 years old (2014),

a statistic which further illustrates energy inefficiency of a part of these houses, as insulation was minimal back at this point in time.

3.6 Energy Efficiency Planning

Kosovo, as a contracting party to the European Union's Treaty establishing the Energy Community is obligated to adopt measures in order to encourage the energy efficiency in the country. Despite the fact that Energy Efficiency is a new subject in Kosovo, the Law on Energy Efficiency was both approved and adopted in 2011, by the Kosovo Assembly. This Law regulates the entire field of energy efficiency – it discloses procedures for preparing and approving energy efficiency plans, it describes responsibilities of institutions involved in this particular area, and controls the implementation of obligations in regards to energy efficiency deriving from the Energy Community Treaty (Energy Efficiency and Renewable Sources in Kosovo, 2012).

As Kosovo aims for EU accession, it has already started working towards objectives that are important for the EU member states themselves, like joining the Energy Community Treaty in 2006. In 2013, the European Bank for Reconstruction and Development (EBRD) established the he Kosovo Sustainable Energy Projects (KOSEP), through which grants are offered to Kosovars who invest in residential and business energy efficiency projects (KOSEP, 2013). Immediately in 2013, the EBRD provided a €5 million loan to TEB Bank in Kosovo for on-lending to residential and business sector for energy efficiency investments. The loan to TEB is the first one under the newly founded Kosovo Sustainable Energy Projects Framework (European Bank, 2013).

Also, the International Finance Corporation of the World Bank has started offering "Residential Energy Efficiency" loans to support families on their endeavor to sustainably reduce their electricity costs (IFC, 2014).

Overall, small, but important, steps are being taken by the Kosovo government and European Union in increasing energy efficiency in households.

4. APPROACH

The project considered the problem of energy efficiency in Kosovo. There were seven phases of data collection and analysis:

1. Examination of the building stock of Pristina
2. Data collected from construction and energy efficiency businesses throughout Kosovo
3. Individual visits to construction businesses in the area of Pristina
4. Monetary value of heat lost
5. Net Present Value, Internal Rate of Return, and Payback Period calculations
6. Cost Benefit Analysis
7. Limitations

4.1 Examination of the building stock of Pristina

A spatial map of Pristina was obtained from the Ministry of Environment and Spatial Planning of Kosovo. This spatial map contained information, such as the building surface areas and the number of floors, on 44,223 buildings in Pristina. A crucial factor for this analysis was the overlaid floor data for residential households. 13,243 households that had this kind of data were examined.

It is assumed that 25% of homes in Kosovo are already insulated, based on survey data collected from INDEP (2014). Therefore, a sample from the remaining 75% of the households in Pristina was selected. It was not known with certainty which homes out of the sample size were insulated; hence, the bootstrap technique was utilized. Since houses are of different sizes, 75% of the original sample (or 9,932 homes) was pulled repeatedly. The bootstrap method allowed for the sample to have a variety of buildings with different surface area be accounted for. The average, minimum, and maximum of this ever-changing sample was taken repeatedly 100 times. Then the average of these 100 averages, minimums, and maximums was calculated in order to get the most representative sample. As a result, three households of different sizes (small, average, and large) were utilized to draw conclusions from. Due to size differentiation, these three model households were deemed representative of real households in Kosovo.

The average price of wall, window, and roof insulation obtained through market research was then applied to the average, minimum, and maximum sizes of households in Pristina. This way, applying the acquired prices to these household sizes, the cost for insulating three different types of households was determined.

4.2 Data collected from construction and energy efficiency businesses throughout Kosovo

The main goal of this phase and the next one was finding out insulation prices through market research conducted by the RIT/A.U.K. Center for Energy and Natural Resources (CENR). During this phase of data collection, a representative sample of construction companies in the country was selected based on the total number of such companies operating in Kosovo. The primary list of energy efficiency and renewable energy businesses was acquired from the Kosovo Sustainable Energy Projects' website (http://www.kosep.org). Nonetheless, since this list was not selected randomly throughout Kosovo, it may have had some selection bias.

Hence, as a means to capture businesses that are outside this list, a detailed list of names and relevant data of construction companies was requested from the registry of the Kosovo Business Registration Agency (KBRA). KBRA operates under the Ministry of Trade and Industry of Kosovo. The reason behind the inclusion of such types of businesses was solely based on the assumption that the majority of energy efficiency products are related to the construction sector. The list obtained from KBRA was cross-referenced with data on businesses that are not on the tax register. This action was done to decrease the chances of contacting businesses no longer in operation. Hence, this list was utilized to locate businesses in areas not represented by the Kosovo Sustainable Energy Projects.

CENR professional staff members, including myself, were involved in collecting the data through telephone calls and visiting businesses to obtain price data. The survey distribution per city is shown in Table 4.1.Since the data was not obtained from one single area, the sample size was more representative.

Overall, 95 surveys of construction and energy efficiency businesses throughout the country were given out from both lists.

Table 4.1 Survey Distribution per City

Cities	Surveys	Cities	Surveys
Prishtina	47	Rahovec	2
Podujeve	2	Obiliq	2
Gjilan	2	Gllogoc	1
Gjakova	2	Gracanice	1
Mitrovica	1	Istog	1
Decan	2	Kacanik	1
Peje	2	Kamenice	1
Prizren	2	Kline	1
Viti	2	Lipjan	1
Ferizaj	2	Shtime	1
Dragash	1	Skenderaj	1
Malisheve	2	Suhareke	1
FusheKosove	12	Vushtrri	1
		Shterpce	1

4.3 Individual visits to construction businesses in the area of Pristina

Additionally, during this phase, the CENR team visited 25 construction and energy efficiency businesses in the Pristina area. These were businesses that sell windows, doors, and insulation material for walls and roofs.

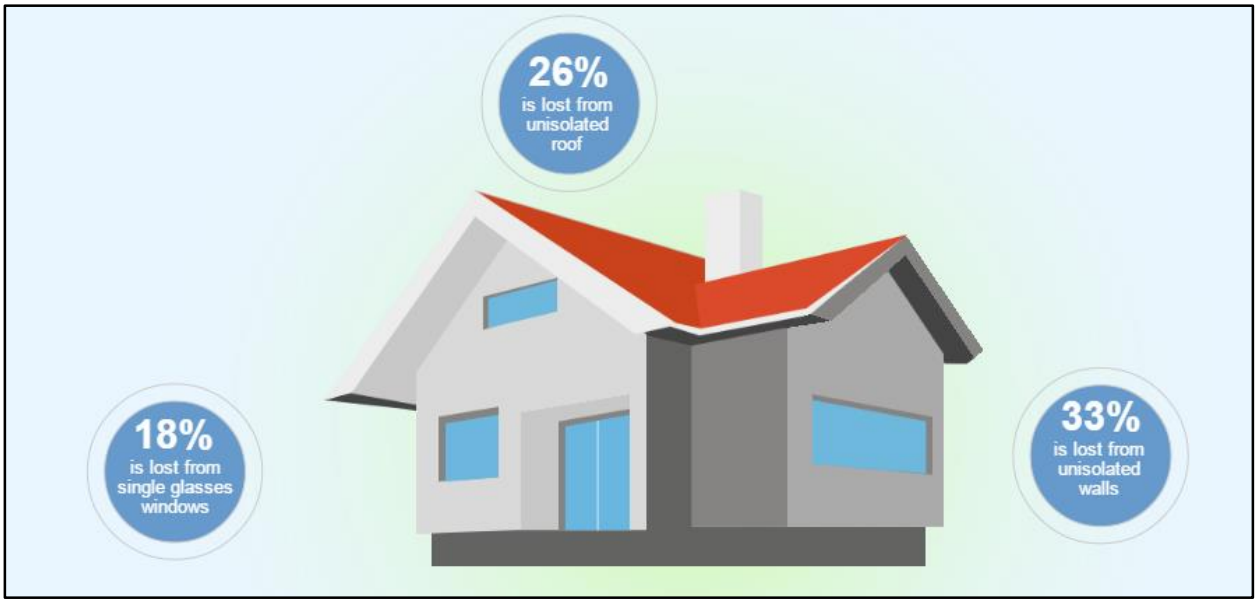
Business owners and employees were more open to discuss their businesses' details in person. Therefore, the response rates per questions were considerably higher than those through phone calls. The interviews lasted around 30 minutes, and very often unveiled other relevant details about this specific sector in regards to the Kosovar economy.

4.4 Monetary Value of Heat Lost

An uninsulated household has heat escaping the house from the walls, windows, and roof. The Kosovo Civil Society Consortium for Sustainable Development (KOSID) has identified the actual percentages of heat lost if a house is not insulated. These percentages are as follows: 33%

of heat is lost from uninsulated walls; 26% from uninsulated roof; and 18% from single glazed windows. The Figure 4.1 illustrates these findings.

Figure 4.1 Heat Lost from Uninsulated Walls in Kosovo



Source: Kosovo Civil Society Consortium for Sustainable Development (KOSID)

According to INDEP, a Kosovar household spends on average €100 on electricity energy bills monthly (2014). Heating contributes with 80% to the electricity bill (Bowen et al., 2013), and the heating lost from uninsulated walls, windows, and roof amounts to 25.67%. Multiplying the electricity bill by the heating contribution to the bill, and that result by the total heating lost would result in the monetary value of the heating lost monthly in a household.

The price of 1 m^3 of wood is considered to be €45, if bought less than three months prior to the heating season. Wood is considered the primary source of energy consumption in Kosovo. The average wood consumption of an average Kosovar household is 10.24 m^3 for a heating season. The heating season includes 7 months, from October to April (RIT/A.U.K. Center for Energy and Natural Resources, 2014). Multiplying the price of 1 m^3 of wood by the average wood consumption, the result would be the valued wood consumption for a household during the heating season. Multiplying this valued wood consumption by the total heat lost (25.67%) would result in the monetary value of the heat lost through wood consumption.

4.5 Net Present Value, Internal Rate of Return, and Payback Period calculations

Net Present Value (NPV) is used to determine the present value of an investment through the discounted sum of all cash flows received from the project. The formula for calculating the Net Present Value is as follows:

$$NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \ldots + \frac{C_T}{(1+r)^T}$$

Where:

$-C_0 = Initial\ Investment$
$C = Cash\ Flow$
$r = Discount\ Rate$
$T = Time$

The Internal Rate of Return (IRR) is the interest rate at which the net present value (NPV) of all the cash flows from a project or investment equal zero. The formula for calculating the Internal Rate of Return is as follows:

$$0 = P_0 + P_1/(1+IRR) + P_2/(1+IRR)^2 + P_3/(1+IRR)^3 + \ldots + P_n/(1+IRR)^n$$

Where:

P_0, P_1, … P_n = The cash flows in periods 1, 2, … n, respectively.

The Payback Period is used to determine the time it will take to recover the initial amount invested on a project or investment. The formula used to calculate the Payback Period is as follows:

$$Payback\ Period = \frac{Initial\ Investment}{Periodic\ Cash\ Flow}$$

4.6 Cost Benefit Analysis

A benefit-cost ratio (BCR) is an indicator that attempts to summarize the overall value for money of a project or proposal. A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs. The formula utilized to calculate this ratio is as follows:

BCR = Discounted value of incremental benefits ÷ Discounted value of incremental costs

All projects with a BCR greater than 1 are to be accepted, when costs and benefits are discounted at the opportunity cost of capital.

Another piece of information important for this analysis is the lifespan of Styrofoam as wall insulation, of roof insulation, and double glazed windows. Styrofoam as wall insulation has a lifespan of 50 years (Plastics Europe, 2010); double glazed windows last for 30 years (Double Glazed, 2012); and mineral wool as a roof insulator has a lifespan of 50 years (European Insulation Manufacturers Association, 2012). The project lifespan, for the sake of cost benefit analysis, has been set to 25 years. The discount rate used is 3.72%, as suggested by Kosovo Banking Association (2013).

4.7 Limitations

The list obtained from the KBRA rarely contained a contact number for businesses of this sector. These missing contact numbers were a significant problem during the second phase of this project. Since no telephone numbers were provided, internet had to be searched to find any contact information of those businesses. As a consequence, the missing numbers severely limited the size of the research sample. The lack of clear and accessible contact information for

businesses in this sector represented a significant information cost for all the stakeholders in this market.

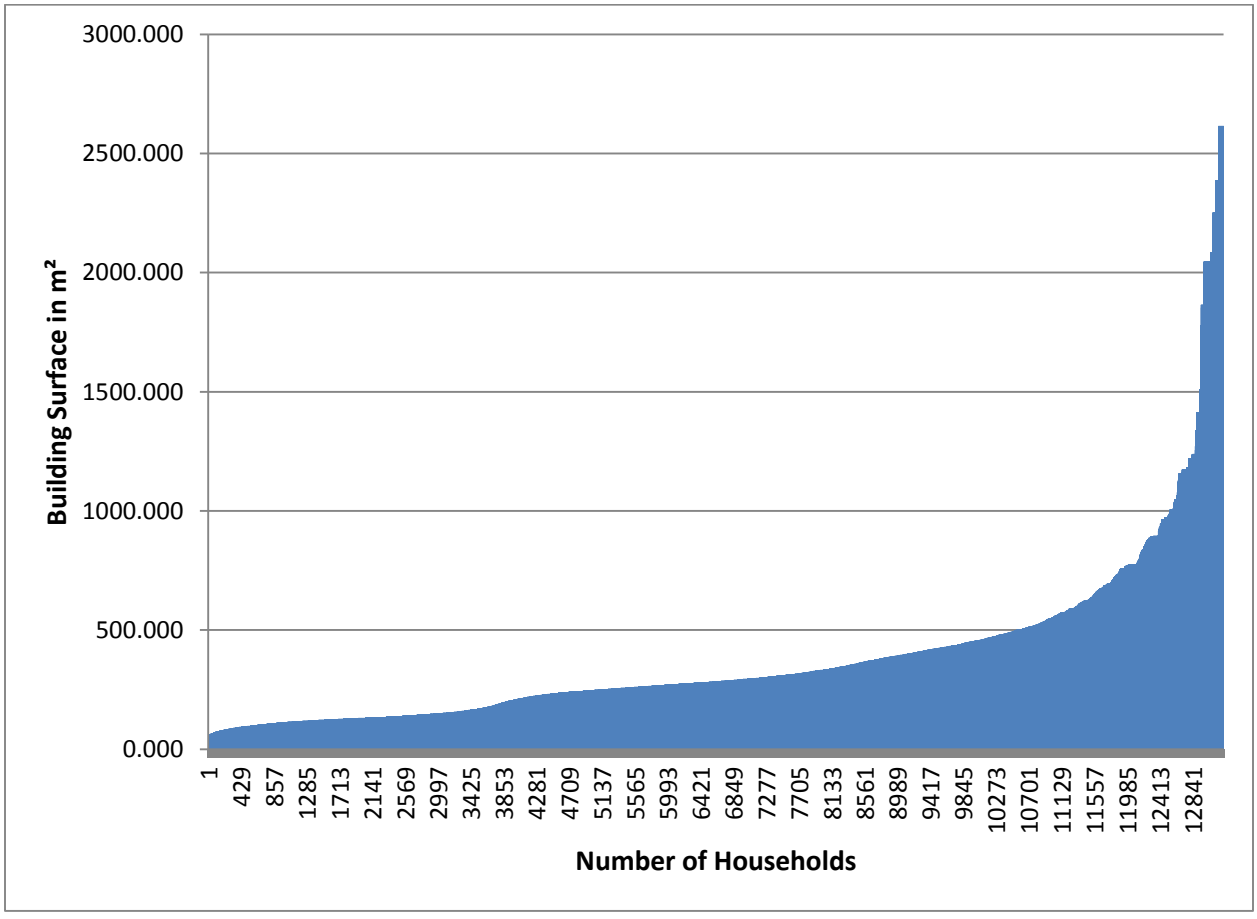
Many responders were unwilling to answer questions over the phone, especially those regarding prices, and requested an in-person visit to their place of business, instead. Additionally, the brochures and catalogues of products in stock were lacking set prices. Numerous businesses requested that the information provided to remain confidential because of their fear of local competition.

5. DATA DISCOVERY

5.1 Number of Uninsulated Households and their Characteristics

As one of the goals of this project was to discover how many Kosovar households need insulation, the spatial map of Pristina obtained from the Ministry of Environment and Spatial Planning of Kosovo was analyzed. Out of the 44,223 buildings, 13,243 residential households were taken in consideration, as residential households are the focus of this study. Due to the size of this sample, households of building surfaces from a minimum of 55 m^2 to a maximum of 2,615 m^2 were represented. The advantage of such a broad range of household sizes is that it can be applicable to other cities in Kosovo, apart from Pristina. Both typical sizes of rural and urban households are thus represented in this sample. Figure 5.1 illustrates the varying building surfaces of these households in m^2.

Figure 5.1 Household Sizes in Pristina



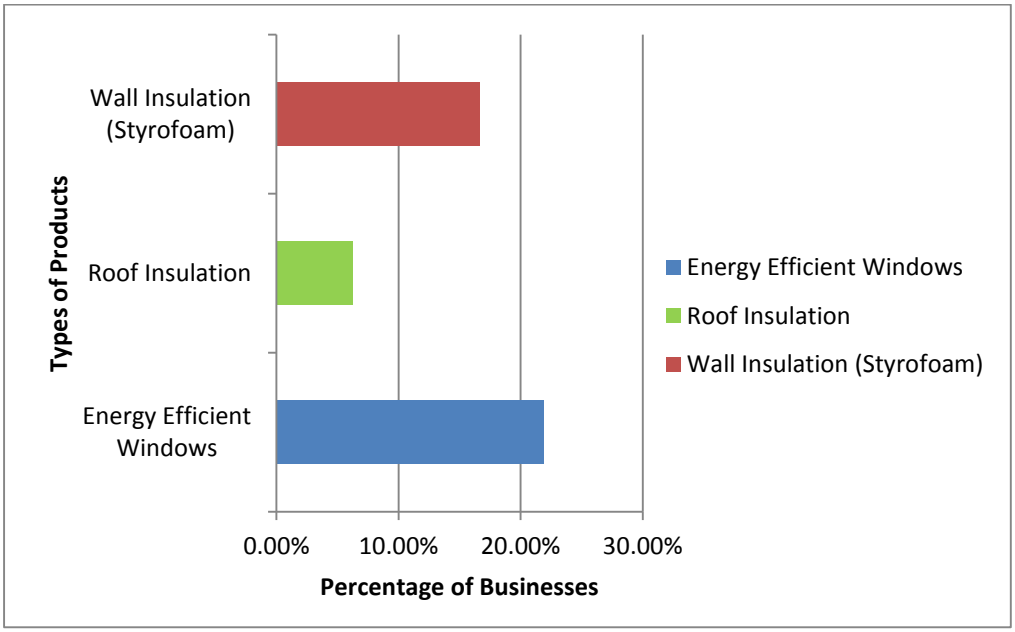
5.2 Residential Insulation Products Available

This section covers the quantities, prices, and surveyed businesses that stock residential insulation materials in Kosovo. The energy efficient products covered in the survey were wall insulation, roof insulation, and energy efficient windows.

Ninety-five businesses were surveyed through phone calls, while twenty-five were contacted in person. The goal of this endeavor was to obtain an overview of the types of energy efficiency products, with the focus on insulation, Kosovar businesses offer.

Figure 5.2 illustrates the availability of energy efficient products in the Kosovo Market, with respect to wall insulation, roof insulation, and energy efficient windows.

Figure 5.2 Availability of Energy Efficiency Products in the Kosovo Market



5.2.1 Wall Insulation

Sixteen of the interviewed businesses indicated they sell Styrofoam as a wall insulation material. The majority of Styrofoam bought in Kosovo is manufactured internally at numerous factories, while occasionally it is imported from Poland, Romania, Macedonia, Austria, and Croatia. The local businesses reported to acquiring the necessary raw materials from Taiwan, and doing the

final preparations in the country. One of the most well-known factories in Kosovo is the "PoFix" company. "PoFix" besides producing and selling the product within the country, it also exports it to other countries like Macedonia, Switzerland, and the United States.

The most common types of Styrofoam purchased in Kosovo are reported to be the N3 and N4 types with 8 cm of depth. As it can be implied, Styrofoam is available in various thicknesses, starting from 1 cm to 12 cm for households. Nonetheless, Styrofoam which is thicker than 12 cm can be purchased upon request. The thickness of Styrofoam can go up to 25 cm. The price for Styrofoam is between €0.41 and €1.25 per cm of depth. The standard surface area of one unit of Styrofoam is $1m^2$. It is noteworthy to mention that two businesses out of sixteen that offered Styrofoam were not willing to give any price information. The average price for 1 cm of depth of Styrofoam for this sample is €0.55. These prices are shown in Table 5.1.

This insulating material is mostly considered to be utilized in the residential sector, with about 70% of cases. 25% of the cases Styrofoam purchases showed to be distributed between the industrial and commercial sectors. More than 90% of the interviewed businesses stated they had the product in stock. However, they solely sell the product, and do not offer installation for those consumers/households purchasing the products. The installation has to be done by yet another party that has to be contracted privately by the consumer.

Table 5.1 Ranges for Wall Insulation and Related Specifications and Dimensions

Business	Price (Range)	Insulation Thickness	Standard Surface Area	Description	Origin	Calculated average price per cm of thickness
6	1-2.5	*1-5cm*	1 m^2	Styrofoam	Kosovo	0.58
7	1	*1cm*	1 m^2	Styrofoam	Kosovo	1.00
7	3.5	*8cm*	1 m^2	Styrofoam	Kosovo	0.44
7	4.5	*10cm*	1 m^2	Styrofoam	Kosovo	0.45
7	3-12	*4-8 cm*	1 m^2	Compressed Glass Wool	Romania	1.25
9	0.8-4.2	*2-10cm*	1 m^2	Styrofoam	Kosovo	0.42
12	0.65	*1cm*	1 m^2	Styrofoam	Kosovo, Austria, Croatia	0.65
12	2.5	*5cm*	1 m^2	Styrofoam		0.50
12	3.3	*8cm*	1 m^2	Styrofoam		0.41
12	4.1	*10cm*	1 m^2	Styrofoam		0.41
17	0.5	*1cm*	1 m^2	Styrofoam (m^2)	Kosovo, Macedonia	0.50
17	5	*10/12cm*	1 m^2	Styrofoam (m^2)		0.45
25	3.7-4.6	*8cm*	1 m^2	N3 and N4 Styrofoam		0.52
26	3.4-4.2	*8cm*	1 m^2	N3 and N4 Styrofoam		0.48
27	3.6	*8cm*	1 m^2	N3 Styrofoam		0.45
28	4.2	*8cm*	1 m^2	N3 Styrofoam		0.53
30	3.3	*8cm*	1 m^2	N3 Styrofoam		0.41
30	5.3	*10cm*	1 m^2	Styrofoam		0.53
33	0.5	*1cm*	1 m^2	Styrofoam		0.50
13	43	*7.2 cm*	1 m^2	Mineral Wool	Poland	0.44

Source: RIT/A.U.K. Center for Energy and Natural Resources (CENR), 2014

5.2.2 Roof Insulation

Out of the six businesses offering roof insulation, only three of them did provide actual prices. For the range of prices as relating to two different types of materials, refer to Table 5.2. The

lowest price reported for insulating 1 m^2 of roof would cost €4.2. The highest price for insulating m^2 of roof was through hydro insulation and was claimed to be €15.

Regarding the origin of the product, most of it was reported to come from Romania. The most common material was discovered to be mineral wool, and the product is typically in the businesses' stock. However, as was the case with wall insulation, installation of the product is not provided by the businesses.

Table 5.2 Price Ranges for Roof Insulation and Related Specifications and Dimensions

Business	Price (Range)	Unit	Thickness	Description	Origin
25	4.2	m²	2.7 cm	Mineral Wool	Romania
25	5.7	m²	2.7 cm	Mineral Wool	Romania
46	15	m²	6 cm	Hydro Insulation	Switzerland

Source: RIT/A.U.K. Center for Energy and Natural Resources (CENR), 2014

5.2.3 Energy Efficient Windows

From the businesses that were interviewed, nine of them reported to sell energy efficient windows. The businesses were asked about a window's standard size in order to acquire a base price. The dimensions of a standard size window were discovered to be 1.40x0.80 meters. The price for an energy efficient window, specifically a double glazed window, ranged from €80 to €120. Further, triple-glazed windows were more expensive, going up to €150 (Table 5.3). On average, a standard-size double glazed window costs €95.63, and a triple-glazed window costs €124. These prices are shown in Table 5.3.

The energy efficient windows are domestically produced, but the raw materials are reported to be obtained from other countries. Windows prices are claimed to depend on whether or not they have double-opening (horizontal and/or vertical), the requested dimensions, and the type of material they are made of (plastic or wood). It has been pointed out that the tripled-glazed windows offer much better insulation in comparison to double-glazed windows. However, the

increase in price tends to be the reason behind why customers purchase the double-glazed ones, as a cheaper version of energy efficient windows.

This product has shown to be geared toward the residential sector. The sales for a business in Kosovo within a period of one year are estimated to be approximately 6,000 for double-glazed windows, while only 100 for triple-glazed.

Table 5.3 Price Ranges for Energy Efficient Windows and Related Specifications and Dimensions

Business	Price (Range)	Price (Range) given for	Description	Origin	Calculated average price per window
30	95	0.8x1.4m	Average (EE) window		95.00
11	80-100	0.8x1.4m	Double-glazed	Kosovo	90.00
18	70-75	0.8x1.4m	Double-glazed	Kosovo	72.50
19	75-100	0.8x1.4m	Double-glazed	Kosovo	87.50
21	110	0.8x1.4m	Double-glazed	Kosovo	110.00
28	110	0.8x1.4m	Double-glazed		110.00
29	80	0.8x1.4m	Double-glazed		80.00
27	120	0.8x1.4m	Double-glazed, Average price according to seller		120.00
11	100-110	0.8x1.4m	Triple-glazed	Kosovo	105.00
18	95	0.8x1.4m	Triple-glazed	Kosovo	95.00
21	150	0.8x1.4m	Triple-glazed	Kosovo	150.00
29	150	0.8x1.4m	Triple-glazed		150.00
31	120	0.8x1.4m	Triple-glazed		120.00

Source: RIT/A.U.K. Center for Energy and Natural Resources (CENR), 2014

6. EXPLORATION

The building stock obtained from the Ministry of Environment and Spatial Planning provided all the sizes of residential households in Pristina. Calculating the average of all average size households brought the result that the size of an average household in Pristina is 148.4 m^2; a typical large size household has the size of 2,402.5 m^2; while a small household is 21.1 m^2. Each one of these three typical sizes of households is to be analyzed in greater detail in the following portions of this section. The full document containing thorough cost-benefit and sensitivity analyses for each of the scenarios outlined in this section during the project lifespan of 25 years can be found in the appendices section.

6.1 Average Size Households

The surface area of an average household in Pristina has the size of 148.4 m^2. Differentiations in terms of primary and secondary energy sources, double- and triple-glazed windows, and insulation thickness are to be discussed next.

6.1.1 Combination of Electricity and Wood; Double Glazed Windows; 5 cm Insulation

As the majority of households in Kosovo utilize an energy consumption mix (RIT/A.U.K. Center for Energy and Natural Resources, 2014), the top two sources of energy – wood and electricity – are assumed to be used in equal combination here. The most common insulation thickness of 5 cm and double-glazed windows are to be theoretically applied to this house of typical characteristics, as seen in Table 6.1.

Table 6.1 Total Wall Insulation Price for an Average House: Model 1

Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 370.48	

The size of a standard double-glazed window is 0.8 x 1.4 m^2, leading to the window area of 1.12 m^2. This number had to be subtracted from the wall area in order to get the total wall area that needs to be insulated. The total wall insulation price in this case is €370.48.

Table 6.2 Total Wall and Roof Insulation Price for an Average House: Model 1

Windows		10	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 956.30	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	

As per double-glazed windows, the installation of 10 windows in this particular house would cost €956.30, while the roof insulation price would be €739.06, as seen in Table 6.2. The overall cost of installing double-glazed windows, and wall and roof insulation would be €2,065.84.

Table 6.3 Loss in Heating and Avoided Wood Consumption for an Average House: Model 1

Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		10.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year

According to INDEP, the average monthly electricity bill for a household is €100 (2014), and electricity contributes to this bill with 80%. By multiplying these two numbers, and then its product by the total heat lost (25.67%), the result is the monetary value of the heat lost monthly. In this type of household, €20.53 are lost from electricity-generated heat (Table 6.3).

According to the RIT/A.U.K Center for Energy and Natural Resources, the average annual wood consumption for a household is 10.24 m^3. Multiplying the wood consumption by the price of wood, the valued wood consumption would be determined. Multiplying this value by the total heat lost (25.67%) results in the lost wood-generated heat.

Utilizing the aforementioned formulas, the Net Present Value (NPV), the Internal Rate of Return (IRR), and the Cost Benefit ratio, as measures of project worth, were determined. All three of them result in positive numbers, proving that the investment is beneficial. This information is shown in Table 6.4.

Table 6.4 NPV, IRR, and B/C Ratio for an Average House: Model 1

NPV		€ 2,233.87	
IRR		13.88%	
B/C		2.05	

Considering the costs and benefits of insulation in this particular house, this investment of €2,065.84 would be recovered in 7 years' time. After 7 years, this house would continue reaping the benefits of spending less on energy bills, the monetary value of which was shown in Table 6.3.

6.1.2 Combination of Electricity and Wood; Triple Glazed Windows; 5 cm Insulation

In this sensitivity analysis, insulation would cost just as much as in the previous example (€370.48), as no parameters of this kind have been altered.

Triple glazed windows are a fraction of the price more expensive (€124) than the double glazed ones (€95.63), and yet, according to the market research done, they are rarely purchased in the Kosovo market. The costs of installing triple-glazed windows, instead of double-glazed ones, are as shown in Table 6.5, while the cost of wall and roof insulation stays the same as in the aforementioned example.

Table 6.5 Total Window Price for an Average House: Model 2

Windows		10	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	

It is thought that triple-glazed windows reduce noise, and are more durable than double-glazed windows. Market research showed that part of the reason triple-glazed windows are not in demand in the Kosovo market is because of the reduced light penetration due to the additional layer of glass, and their overall greater weight than a double-glazed window.

With the price of roof insulation €739.06 the overall cost of installing triple-glazed windows and wall and roof insulation would be €2,349.54.

As expected, the NPV, the IRR, and the cost benefit ratio are slightly lower with triple-glazed windows due to the increase in price. Nevertheless, the project seems to be beneficial, as all numbers are positive and the benefit cost ratio is higher than 1. The results from each ratio can be viewed in the Table 6.6.

Table 6.6 NPV, IRR, B/C Ratio for an Average House: Model 2

NPV		€ 1,960.29	
IRR		11.66%	
B/C		1.80	

The monetary value of the losses in heating is identical to the previously discussed house. There is a loss in heating from electricity of €20.53 monthly, and €118.27 in wood-generated heat annually. Meaning, this amount of money can be saved by spending less on energy for heating the house.

6.2 Large Size Households

As households of different sizes have different insulation investment needs, a distinguishment between house sizes was made. The surface area of a large household in Pristina has the size of

2,402.5 m^2. Differentiations in terms of primary and secondary energy sources, double- and triple-glazed windows, and insulation thickness are to be discussed next.

6.2.1 Combination of Electricity and Wood; Double Glazed Windows; 5 cm Insulation

The target of this analysis was the installation of double-glazed windows, 5 cm insulation thickness, and calculations on loss from electricity- and wood-generated heat on a large size household. The calculation procedure of costs is the same as before. The only difference between this house and the ones previously discussed would be the larger total wall area to be insulated. In this case, the total wall insulation price is over 100% more expensive than that of the average size household. Detailed information on wall insulation calculations can be found in Table 6.7.

Table 6.7 Total Wall Insulation Price for a Large House: Model 1

Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 841.37	

The number of windows designated for the large size household (30) is three times as much as that in an average home. This is the reason behind a relatively high cost of double-glazed window installation of almost €3,000. On the bright side, the increased number of windows leads to a smaller wall area to be insulated. Also, due to the relatively big surface area of the house, the surface area of the roof is also bigger than that of an average house. This is why the total roof insulation price is around 10 times higher than that of an average household, amounting to almost €8,000. The overall cost of installing double-glazed windows, and wall and roof insulation would be €11,686.77. The detailed procedure of getting to such results is illustrated in Table 6.8.

Table 6.8 Window and Roof Insulation for a Large House: Model 1

Windows		30	per house
Window Area		1.12	m^2 per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 2,868.90	
Surface Area of Roof		961.0243326	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	

As the size of the large household is almost 15 times bigger than the average one, adjustments were needed to be made in terms of the electricity bill. One third of the difference in size between the two houses (5) was multiplied with the average home's bill, leading to €500. In this case, the monthly loss in heating from electricity is 1/5 of the entire electricity bill.

In regards to wood, the average wood consumption was assumed to be 10 m^3 more than that of an average household. Hence, the annual heat lost from wood consumption is €233.77, or 25% of the entire valued consumption of wood. Detailed calculations can be found in the Table 6.9.

Table 6.9 Loss in Heating and Avoided Wood Consumption for a Large House: Model 1

Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		20.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year

The measures of project worth are all positive numbers, and the action of insulating the home is worth undertaking. Nonetheless, the numbers are lower than those of the average household. This information can be found in the Table 6.10.

Table 6.10 NPV, IRR, B/C Ratio for a Large House: Model 1

NPV		€ 4,092.54	
IRR		7.20%	
B/C		1.31	

6.2.2 Electricity Heating; Triple Glazed Windows; 5 cm Insulation

This analysis is done on a large size house, where triple-glazed windows and a 5 cm wall insulation depth are to be theoretically installed. This house utilizes only one energy source – wood. As shown in the Table 6.11, the total wall insulation price for this house is €841.37.

Table 6.11 Total Wall Insulation Price for a Large House: Model 2

Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 841.37	

The total price for window installation is higher than in any other scenario previously elaborated due to the high number of windows and their type. The combination of triple-glazed windows' price with the quantity required for this type of home, leads to a total window price of €3,720. Due to the bigger surface area of the roof, the total insulation price is almost €8,000. The overall cost of installing triple-glazed windows, and wall and roof insulation in a house using electricity as its only energy source would be €12,537.87. This information can be observed in greater detail in the Table 6.12.

Table 6.12 Total Window and Roof Insulation Price for a Large House: Model 2

Windows		30	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	

Since it is being assumed that this household utilizes electricity as its only source of energy, it would not save any wood-generated heat if it would invest in insulation. It would rather save €102.67 monthly in avoiding loss in heating from electricity. The Table 6.13 summarizes this information.

Table 6.13 Loss in Heating and Avoided Wood Consumption for a Large House: Model 2

Adjusted Electricity Bill		€	500.00	per month
Heating Contribution to Bill			80%	
Heating Loss from Walls			33%	
Heating Loss from Windows			18%	
Heating Loss from Roof			26%	
Total Heating Lost			25.67%	
Loss in Heating		€	102.67	per month
Avrg Wood Consumption			0	m^3 per year
Price of wood		€	45.00	per m^3
Valued Wood Consumption		€	-	per year
Avoided Wood Consumption		€	-	per year

As a result, NPV, IRR and the Cost Benefit ratio show that this investment would not be wise. The Cost Benefit ratio is below 1. The estimated savings do not seem to overcome the cost of 30 triple-glazed windows, and the lack of a secondary energy source from which the lost heat would be saved. The end results of these ratios can be found in the Table 6.14.

Table 6.14 NPV, IRR, and B/C Ratio for a Large House: Model 2

NPV		€	(498.81)	
IRR			3.27%	
B/C			0.92	

6.3 Small Size Households

The surface area of a small household in Pristina has the size of 21.18 m^2. Differentiations in terms of primary and secondary energy sources, double- and triple-glazed windows, and insulation thickness are to be discussed next.

6.3.1 Combination of Electricity and Wood; Double Glazed Windows; 5 cm Insulation

The objective of this analysis was to estimate the costs of installing double-glazed windows and a 5 cm thick wall insulation in a household using both electricity and wood. The total insulation price is estimated to be €382.80. The calculation procedure up to this result is illustrated in the Table 6.15.

Table 6.15 Total Wall Insulation Price for a Small House: Model 1

Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 382.80	

Now that the size of the house being analyzed is smaller, the number of windows is fewer. As unusual as it may seem, this could be the size of a household in a remote village. The total double-glazed window price is €573.78, as seen in Table 6.16. As the surface area of the house is smaller, so is the surface area of the roof. The total roof insulation price €211, which is the lowest price derived from any of the aforementioned scenarios. The overall cost of installing double-glazed windows, and wall and roof insulation would be €1,167.61.

Table 6.16 Total Window and Roof Insulation Price for a Small House: Model 1

Windows		6	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 573.78	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	

A house this small does not have the capacity to spend the average €100 on electricity monthly. Instead, it was assumed it would spend €20 (or 20% of the average price) towards this bill. The loss in heating would be €4, or 20% of the total electricity cost incurred.

Table 6.17 Loss in Heating and Avoided Wood Consumption for a Small House: Model 1

Adjusted Electricity Bill		€	20.00	per month
Heating Contribution to Bill			80%	
Heating Loss from Walls			33%	
Heating Loss from Windows			18%	
Heating Loss from Roof			26%	
Total Heating Lost			25.67%	
Loss in Heating		€	4.11	per month
Avrg Wood Consumption			4	m^3 per year
Price of wood		€	45.00	per m^3
Valued Wood Consumption		€	180.00	per year
Avoided Wood Consumption		€	46.20	per year

The average wood consumption was assumed to be 4 m^3, or 20% of the average wood consumption. The monetary value of the wood-generated heat lost would be €46.20 annually. These estimations can be found in Table 6.17.

When it comes to measures of project worth, this investment seems to be a good idea, but not very profitable in the long run. The IRR is not that high, while the Cost Benefit ratio is barely above 1. Nonetheless, for a household of this size, these ratios may be significantly positive, considering that such measurements indicate an unstable source of revenues. As such, families living in these considerably small spaces could benefit from this prospect since it adds a factor of security during the harsh winters in Kosovo. These ratios can be found in Table 6.18.

Table 6.18 NPV, IRR, B/C Ratio for a Small House: Model 1

NPV		€	82.90	
IRR			4.44%	
B/C			1.04	

6.3.2 Wood Heating; Double Glazed Windows; 5 cm Insulation

The total wall insulation price for this scenario of characteristics is the same as the latter – €382.80. Also, its total double-glazed window and total roof insulation prices did not change – €573.78 and €211.03, respectively. The only unique aspect of this sensitivity analysis is the fact that this household uses wood as its only energy source.

As this could easily be a remote-village household, electricity may not be accessible to it. Therefore, the only benefit would be an avoided wood consumption of €46.2. This information is illustrated in Table 6.19.

Table 6.19 Loss in Heating and Avoided Wood Consumption for a Small House: Model 2

Adjusted Electricity Bill			-	per month
Heating Contribution to Bill			80%	
Heating Loss from Walls			33%	
Heating Loss from Windows			18%	
Heating Loss from Roof			26%	
Total Heating Lost			25.67%	
Loss in Heating		€	-	per month
Avrg Wood Consumption			4	m^3 per year
Price of wood		€	45.00	per m^3
Valued Wood Consumption		€	180.00	per year
Avoided Wood Consumption		€	46.20	per year

The NPV, IRR, and the Cost Benefit ratio show that the investment would not be a wise one. The NPV is a negative number, the IRR a negative percentage, while the Cost Benefit ratio is below 1. These results can be identified in Table 6.20.

Table 6.20 NPV, IRR, B/C Ratio for a Small House: Model 2

NPV		€	(380.77)	
IRR			-0.09%	
B/C			0.64	

7. DELIBERATION

Among other things, this study showed the availability and prices of residential insulation products in the local market. The availability of energy efficient windows in particular has indicated that the demand for these products is strong. Specifically, about 16.8% of businesses in Kosovo sell energy efficiency windows and about 8.4% offer wall insulation. These numbers indicate the energy efficiency measures people are taking in their homes, as households are reported to be the main customers of these types of insulation.

Double-glazed windows are demonstrating to be a profitable business for the local producers. Instead of importing them, these local companies often manufacture these windows themselves. Nonetheless, triple-glazed windows are not very much present in the marketplace. This situation could be mainly attributed to the higher price they have in comparison to the double-glazed windows.

Wall insulation is provided according to customers' specifications. The Styrofoam used as a wall insulator is typically offered for external walls of houses and buildings. This way, facilities keep a stable temperature and adequate protection from the external weather conditions. However, some businesses around the Prishtina area have claimed to have suffered a considerable decrease in their sales. The new municipality's law enforcements regarding building in the city area are reported to be the culprit. Another factor reported was the lack of people's financial support to insulate their homes.

7.1 Payback Period of Residential Insulation

Pertaining to one of the goals of this project, the payback period of an insulation investment (in windows, walls, and roof) was calculated. The main reason behind this endeavor is the fact that a vast number of Kosovo households are not insulated due to the high initial cost of doing so. This situation directly impacts the extent to which energy saving measures are efficient in such households. The benefit of insulation is the decrease in energy spending, which serves to recover the investment and further save from lower energy consumption.

The payback period of investing in residential insulation for a household of an average size, which uses an average amount of electricity and wood, would be 7 years (Table 7.1). The specific investment would be the installation of double-glazed windows, and wall (5 cm thick) and roof insulation. At the end of the project's lifespan (25 years), this household, except for covering its costs, would save around €4,000 in decreased energy spending.

Table 7.1 Payback Period of Insulation Investment for an Average House with Average Characteristics

Payback Period		
7 years	10 months	19 days

Investing in residential insulation (double-glazed windows, 5 cm thick wall insulation, and roof insulation) for a household of a large size has a payback period of 12 years (Table 7.2). The higher payback period is due to the considerably bigger surface area of the large house compared to the average one. Despite covering insulation costs, this house would have saved over €10,000 in decreased energy spending generated from both electricity and wood over the next 13 years.

Table 7.2 Payback Period for Insulation Investment for a Large House with Average Characteristics

Payback Period		
12 years	3 months	9 days

A household of a small size has a payback period of 15 years (Table 7.3). The investment includes installation of double-glazed windows, wall insulation of 5 cm thick, and roof insulation. This house has fewer benefits than the other models discussed because its energy spending was lower than that of the other houses to begin with. Thus, the decrease in spending in this house is going to be considerably lower than in the other ones. After covering the insulation costs, this small house would save around €700 in consuming less electricity and wood in regards to heating along this project's lifespan (25 years).

Table 7.3 Payback Period for Insulation Investment for a Small House with Average Characteristics

Payback Period		
15 years	6 months	30 days

Conclusively, the benefits of residential insulation far outweigh its costs. House owners are usually reluctant to invest in this aspect due to the high costs incurred. However, they need to be informed of the steady benefits they would reap during the following years. After the payback period and this project's lifespan of 25 years, these households would continue to save money up to 50 years as they decrease their spending due to heat not escaping the house.

7.2 Energy Efficiency Programs in Kosovo

In addition to contacting businesses selling residential insulation, the CENR team also visited banks. The two banks which have been the most vehement about energy efficiency in their advertising campaigns are the ProCredit Bank and the TEB Bank. The ProCredit Bank launched a program of green finance products, the first of its kind in Kosovo, in 2009. These so-called "EKO Loans" offer energy efficiency loans to both private customers and businesses. Despite offering loans, the ProCredit Bank provides a thorough analysis of energy efficiency products' benefits both online and in printed brochures. The TEB Bank offers a "green loan," which is done in cooperation with the European Bank for Reconstruction and Development. It promotes that up to 20% of the total sum of their "green loan," is reimbursed to eligible clients. Both of these banks had their programs displayed in the BAU Market and Gorenje stores.

Even though such energy efficiency programs are existent, more than half of Kosovo businesses are not aware of them. This situation establishes a lack of proper communication between the local operating businesses and the energy efficiency program providers. Establishing and ensuring a better communication channel between these two parties could prove to be profitable for the local businesses and for the consumers who could, in turn, make use of the marketplace opportunities. With around 71% of businesses never involved in any energy efficiency training, offering these businesses the suitable background knowledge through workshops and training sessions could change this situation in the future.

Many businesses state that energy efficiency products should be made more attractive to local customers by exempting such products from taxes; hence, making them more attractive among competitors in the marketplace. Some businesses which manufacture double-glazed windows locally suggested that subventions in the form of machinery would characterize another beneficial way for these businesses to continue operating and succeeding in the marketplace.

8. RECOMMENDATIONS

1. The Government of Kosovo should provide subsidies for building efficiency improvements. Insulation would keep households cooler in the summer and warmer in the winter. This situation would provide for a reduction of the amount of heating and cooling appliances needed to use to keep homes comfortable. Conclusively, home insulation would reduce household's energy bills.

   As a result, the consumption of fire wood would be cut down; thereby, preventing deforestation. Also, the volume of electricity imports would be minimized; thereby, reducing the need for millions of euros worth of government subsidies in the electricity sector.

   Some businesses which manufacture double-glazed windows locally suggested that subventions in the form of machinery would ensure their businesses to continue operating and succeeding in the marketplace.

2. Commercial banks in Kosovo should consider providing longer "grace periods" in repaying eco-loans. The option to start paying the first instalment later in time would incentivize those interested to insulate their homes. Offering eco-loans with lower interest rates would also serve as an incentive for people to undertake such an investment.

3. The Government should raise awareness about the many benefits of residential insulation. This could be done in the form of TV ads, brochures, and flyers. With around 71% of businesses never involved in any energy efficiency training, offering these businesses the suitable background knowledge through workshops and training sessions could change this situation in the future.

4. The Government should consider exempting energy efficiency products from taxes. This way, these products would become more attractive among business competitors in the marketplace.

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10. APPENDICES

10.1 Appendix I

This research project is being conducted by the Center for Energy and Natural Resources. We are collecting information on the market for energy efficient products and services in Kosovo.

I would like to ask you some questions regarding your business and its activities. Feel free to not respond to any question. All the information obtained will be treated with confidentiality and will be used anonymously for research purposes. There are no risks related to participating in this research.

Would you like to participate in our survey?

Thank you for your time and cooperation.

IDENTIFYING INFORMATION

Business: _____

Address: _____

Name: _____

Profession: _____

Phone: _____

Email: _____

GENERAL

1) How many people are people employed in your business

Type	Family	Not-family	Salary
Partial			
Full-time			
As needed			

2) How long has your business been in operation ?_____

3) What kinds of promotions or marketing of your products do you typically do? And Where?

4) What can the government do in order to support the energy efficiency sector?

5) Can you give an estimation of the total revenue for the business (post-tax)?_____

6) How much of your business revenue comes from EE and RE products?_____

7) Have you thought about expanding your EE and RE business? Reasons?

8) Have you ever taken any training on EE or RE? and what did they cover?

9) Do you know what programs are operating in Kosovo to promote EE and RE? Please list.

10) Would you like us to inform you of these programs as they become available? _____Yes ___No

    a) Can we use the contact information provided above?___Yes ___No

11) Can you give me an example of a typical EE/RE project and how quickly the return is on the investment?

CONSUMERS

12) Who are typically your consumers (top 3)
    a) Homeowners
    b) Businesses/Commercial
    c) Construction companies
    d) Municipalities
    e) NGOs
    f) Other: _____

13) How far do you typically supply to in Kosovo?_____
14) Do you understand the potential savings from the prospective of the consumer of the products that you are selling?

PRODUCTS

15) Of the following energy efficient and renewable energy products, please indicate the following:

- **Solar Panels**
- **Solar hot water heaters**
- **Micro wind turbines**
- **Pellet stoves and furnaces**
- **Heat pumps**
- **Geothermal**
- **LED lighting**
- **CFL Lightning**
- **Wall insulation (Styrofoam) Roof Insulation**
- **Energy Efficient Bricks**
- **Energy Efficient Tiles**
- **Energy Efficient Windows**
- **Energy Efficient Doors**
- **Biogas systems**
- **Biomass furnaces for heat/electricity**
- **Waste to energy systems**
- **Passive solar design/construction**
- **Ceiling fans and similar**

Item	What is the price range?	specs/size	How many were sold last year?	Country of Origin	Products geared toward (R,C,I, O)	In Stock y/n	Deliver y/n	Installed y/n

10.2 Appendix II

Acronym Table		
Sheet Number	**Acronym**	**Description**
Sheet 1	AAAA	Average Size House; Combined Wood and Electricity Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 2	AAAB	Average Size House; Combined Wood and Electricity Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 3	AABA	Average Size House; Combined Wood and Electricity Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 4	AABB	Average Size House; Combined Wood and Electricity Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 5	ABAA	Average Size House; Wood Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 6	ABAB	Average Size House; Wood Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 7	ABBA	Average Size House; Wood Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 8	ABBB	Average Size House; Wood Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 9	ACAA	Average Size House; Electricity Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 10	ACAB	Average Size House; Electricity Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 11	ACBA	Average Size House; Electricity Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 12	ACBB	Average Size House; Electricity Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 13	BAAA	Maximum Size House; Combined Wood and Electricity Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 14	BAAB	Maximum Size House; Combined Wood and Electricity Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 15	BABA	Maximum Size House; Combined Wood and Electricity Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 16	BABB	Maximum Size House; Combined Wood and Electricity Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 17	BBAA	Maximum Size House; Wood Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 18	BBAB	Maximum Size House; Wood Heating; Triple Glazed Windows; 10cm Insulation Thickness

Sheet 19	BBBA	Maximum Size House; Wood Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 20	BBBB	Maximum Size House; Wood Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 21	BCAA	Maximum Size House; Electricity Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 22	BCAB	Maximum Size House; Electricity Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 23	BCBA	Maximum Size House; Electricity Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 24	BCBB	Maximum Size House; Electricity Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 25	CAAA	Minimum Size House; Combined Wood and Electricity Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 26	CAAB	Minimum Size House; Combined Wood and Electricity Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 27	CABA	Minimum Size House; Combined Wood and Electricity Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 28	CABB	Minimum Size House; Combined Wood and Electricity Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 29	CBAA	Minimum Size House; Wood Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 30	CBAB	Minimum Size House; Wood Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 31	CBBA	Minimum Size House; Wood Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 32	CBBB	Minimum Size House; Wood Heating; Double Glazed Windows; 10cm Insulation Thickness
Sheet 33	CCAA	Minimum Size House; Electricity Heating; Triple Glazed Windows; 5cm Insulation Thickness
Sheet 34	CCAB	Minimum Size House; Electricity Heating; Triple Glazed Windows; 10cm Insulation Thickness
Sheet 35	CCBA	Minimum Size House; Electricity Heating; Double Glazed Windows; 5cm Insulation Thickness
Sheet 36	CCBB	Minimum Size House; Electricity Heating; Double Glazed Windows; 10cm Insulation Thickness

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 370.48	
Windows		10	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		10.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ 1,960.29	
IRR		11.66%	
B/C		1.80	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 370.48	€ 1,240.00	€ 739.06	€ 2,349.54	€ 143.73	€ 118.27	€ 262.01	€ 252.66	€ (2,087.54)	€ (2,013.05)
2	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 243.64	€ 262.01	€ 243.64
3	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 234.95	€ 262.01	€ 234.95
4	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 226.57	€ 262.01	€ 226.57
5	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 218.48	€ 262.01	€ 218.48
6	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 210.69	€ 262.01	€ 210.69
7	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 203.17	€ 262.01	€ 203.17
8	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 195.92	€ 262.01	€ 195.92
9	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 188.93	€ 262.01	€ 188.93
10	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 182.19	€ 262.01	€ 182.19
11	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 175.69	€ 262.01	€ 175.69
12	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 169.42	€ 262.01	€ 169.42
13	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 163.38	€ 262.01	€ 163.38
14	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 157.55	€ 262.01	€ 157.55
15	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 151.92	€ 262.01	€ 151.92
16	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 146.50	€ 262.01	€ 146.50
17	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 141.28	€ 262.01	€ 141.28
18	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 136.24	€ 262.01	€ 136.24
19	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 131.38	€ 262.01	€ 131.38
20	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 126.69	€ 262.01	€ 126.69
21	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 122.17	€ 262.01	€ 122.17
22	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 117.81	€ 262.01	€ 117.81
23	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 113.61	€ 262.01	€ 113.61
24	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 109.55	€ 262.01	€ 109.55
25	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 105.64	€ 262.01	€ 105.64
Totals	€ 370.48	€ 1,240.00	€ 739.06	€ 2,349.54	€ 3,593.33	€ 2,956.80	€ 6,550.13	€ 4,226.01	€ 4,200.59	€ 1,960.29

AAAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 10 cm Thickness		€ 5.50	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		134.72	m^2
Total Wall Insulation Price		€ 740.96	
Windows		10	per house
Window Area		1.12	m^2 per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	
Surface Area of Roof		89.04362222	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		10.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ 1,603.03	
IRR		9.43%	
B/C		1.55	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 740.96	€ 1,240.00	€ 739.06	€ 2,720.02	€ 143.73	€ 118.27	€ 262.01	€ 252.66	€ (2,458.02)	€ (2,370.32)
2	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 243.64	€ 262.01	€ 243.64
3	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 234.95	€ 262.01	€ 234.95
4	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 226.57	€ 262.01	€ 226.57
5	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 218.48	€ 262.01	€ 218.48
6	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 210.69	€ 262.01	€ 210.69
7	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 203.17	€ 262.01	€ 203.17
8	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 195.92	€ 262.01	€ 195.92
9	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 188.93	€ 262.01	€ 188.93
10	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 182.19	€ 262.01	€ 182.19
11	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 175.69	€ 262.01	€ 175.69
12	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 169.42	€ 262.01	€ 169.42
13	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 163.38	€ 262.01	€ 163.38
14	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 157.55	€ 262.01	€ 157.55
15	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 151.92	€ 262.01	€ 151.92
16	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 146.50	€ 262.01	€ 146.50
17	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 141.28	€ 262.01	€ 141.28
18	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 136.24	€ 262.01	€ 136.24
19	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 131.38	€ 262.01	€ 131.38
20	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 126.69	€ 262.01	€ 126.69
21	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 122.17	€ 262.01	€ 122.17
22	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 117.81	€ 262.01	€ 117.81
23	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 113.61	€ 262.01	€ 113.61
24	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 109.55	€ 262.01	€ 109.55
25	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 105.64	€ 262.01	€ 105.64
Totals	€ 740.96	€ 1,240.00	€ 739.06	€ 2,720.02	€ 3,593.33	€ 2,956.80	€ 6,550.13	€ 4,226.01	€ 3,830.11	€ 1,603.03

AAAB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 5 cm Thickness		€ 2.75	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		134.72	m^2
Total Wall Insulation Price		€ 370.48	
Windows		10	per house
Window Area		1.12	m^2 per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 956.30	
Surface Area of Roof		89.04362222	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		10.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ 2,233.87	
IRR		13.88%	
B/C		2.05	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 370.48	€ 956.30	€ 739.06	€ 2,065.84	€ 143.73	€ 118.27	€ 262.01	€ 252.66	€ (1,803.84)	€ (1,739.48)
2	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 243.64	€ 262.01	€ 243.64
3	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 234.95	€ 262.01	€ 234.95
4	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 226.57	€ 262.01	€ 226.57
5	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 218.48	€ 262.01	€ 218.48
6	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 210.69	€ 262.01	€ 210.69
7	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 203.17	€ 262.01	€ 203.17
8	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 195.92	€ 262.01	€ 195.92
9	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 188.93	€ 262.01	€ 188.93
10	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 182.19	€ 262.01	€ 182.19
11	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 175.69	€ 262.01	€ 175.69
12	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 169.42	€ 262.01	€ 169.42
13	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 163.38	€ 262.01	€ 163.38
14	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 157.55	€ 262.01	€ 157.55
15	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 151.92	€ 262.01	€ 151.92
16	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 146.50	€ 262.01	€ 146.50
17	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 141.28	€ 262.01	€ 141.28
18	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 136.24	€ 262.01	€ 136.24
19	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 131.38	€ 262.01	€ 131.38
20	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 126.69	€ 262.01	€ 126.69
21	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 122.17	€ 262.01	€ 122.17
22	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 117.81	€ 262.01	€ 117.81
23	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 113.61	€ 262.01	€ 113.61
24	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 109.55	€ 262.01	€ 109.55
25	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 105.64	€ 262.01	€ 105.64
Totals	€ 370.48	€ 956.30	€ 739.06	€ 2,065.84	€ 3,593.33	€ 2,956.80	€ 6,550.13	€ 4,226.01	€ 4,484.29	€ 2,233.87

Payback Period		
7 years	10 months	19 days

AABA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 740.96	
Windows		10	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 956.30	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		10.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ 1,876.61	
IRR		11.08%	
B/C		1.73	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 740.96	€ 956.30	€ 739.06	€ 2,436.32	€ 143.73	€ 118.27	€ 262.01	€ 252.66	€ (2,174.32)	€ (2,096.74)
2	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 243.64	€ 262.01	€ 243.64
3	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 234.95	€ 262.01	€ 234.95
4	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 226.57	€ 262.01	€ 226.57
5	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 218.48	€ 262.01	€ 218.48
6	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 210.69	€ 262.01	€ 210.69
7	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 203.17	€ 262.01	€ 203.17
8	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 195.92	€ 262.01	€ 195.92
9	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 188.93	€ 262.01	€ 188.93
10	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 182.19	€ 262.01	€ 182.19
11	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 175.69	€ 262.01	€ 175.69
12	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 169.42	€ 262.01	€ 169.42
13	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 163.38	€ 262.01	€ 163.38
14	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 157.55	€ 262.01	€ 157.55
15	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 151.92	€ 262.01	€ 151.92
16	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 146.50	€ 262.01	€ 146.50
17	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 141.28	€ 262.01	€ 141.28
18	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 136.24	€ 262.01	€ 136.24
19	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 131.38	€ 262.01	€ 131.38
20	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 126.69	€ 262.01	€ 126.69
21	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 122.17	€ 262.01	€ 122.17
22	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 117.81	€ 262.01	€ 117.81
23	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 113.61	€ 262.01	€ 113.61
24	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 109.55	€ 262.01	€ 109.55
25	€ -	€ -	€ -	€ -	€ 143.73	€ 118.27	€ 262.01	€ 105.64	€ 262.01	€ 105.64
Totals	€ 740.96	€ 956.30	€ 739.06	€ 2,436.32	€ 3,593.33	€ 2,956.80	€ 6,550.13	€ 4,226.01	€ 4,113.81	€ 1,876.61

AABB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 5 cm Thickness		€ 2.75	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		134.72	m^2
Total Wall Insulation Price		€ 370.48	
Windows		10	per house
Window Area		1.12	m^2 per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	
Surface Area of Roof		89.04362222	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		10.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ (358.05)	
IRR		2.02%	
B/C		0.81	

Year	Wall Insulation Cos	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 370.48	€ 1,240.00	€ 739.06	€ 2,349.54	€ -	€ 118.27	€ 118.27	€ 114.05	€ (2,231.27)	€ (2,151.66)
2	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 109.98	€ 118.27	€ 109.98
3	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 106.06	€ 118.27	€ 106.06
4	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 102.27	€ 118.27	€ 102.27
5	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 98.63	€ 118.27	€ 98.63
6	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 95.11	€ 118.27	€ 95.11
7	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 91.71	€ 118.27	€ 91.71
8	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 88.44	€ 118.27	€ 88.44
9	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 85.29	€ 118.27	€ 85.29
10	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 82.24	€ 118.27	€ 82.24
11	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 79.31	€ 118.27	€ 79.31
12	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 76.48	€ 118.27	€ 76.48
13	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 73.75	€ 118.27	€ 73.75
14	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 71.12	€ 118.27	€ 71.12
15	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 68.58	€ 118.27	€ 68.58
16	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 66.13	€ 118.27	€ 66.13
17	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 63.77	€ 118.27	€ 63.77
18	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 61.50	€ 118.27	€ 61.50
19	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 59.30	€ 118.27	€ 59.30
20	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 57.19	€ 118.27	€ 57.19
21	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 55.15	€ 118.27	€ 55.15
22	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 53.18	€ 118.27	€ 53.18
23	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 51.28	€ 118.27	€ 51.28
24	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 49.45	€ 118.27	€ 49.45
25	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 47.69	€ 118.27	€ 47.69
Totals	€ 370.48	€ 1,240.00	€ 739.06	€ 2,349.54	€ -	€ 2,956.80	€ 2,956.80	€ 1,907.66	€ 607.26	€ (358.05)

ABAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 740.96	
Windows		10	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		10.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ (715.31)	
IRR		0.71%	
B/C		0.70	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 740.96	€ 1,240.00	€ 739.06	€ 2,720.02	€ -	€ 118.27	€ 118.27	€ 114.05	€ (2,601.75)	€ (2,508.92)
2	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 109.98	€ 118.27	€ 109.98
3	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 106.06	€ 118.27	€ 106.06
4	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 102.27	€ 118.27	€ 102.27
5	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 98.63	€ 118.27	€ 98.63
6	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 95.11	€ 118.27	€ 95.11
7	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 91.71	€ 118.27	€ 91.71
8	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 88.44	€ 118.27	€ 88.44
9	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 85.29	€ 118.27	€ 85.29
10	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 82.24	€ 118.27	€ 82.24
11	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 79.31	€ 118.27	€ 79.31
12	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 76.48	€ 118.27	€ 76.48
13	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 73.75	€ 118.27	€ 73.75
14	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 71.12	€ 118.27	€ 71.12
15	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 68.58	€ 118.27	€ 68.58
16	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 66.13	€ 118.27	€ 66.13
17	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 63.77	€ 118.27	€ 63.77
18	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 61.50	€ 118.27	€ 61.50
19	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 59.30	€ 118.27	€ 59.30
20	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 57.19	€ 118.27	€ 57.19
21	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 55.15	€ 118.27	€ 55.15
22	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 53.18	€ 118.27	€ 53.18
23	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 51.28	€ 118.27	€ 51.28
24	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 49.45	€ 118.27	€ 49.45
25	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 47.69	€ 118.27	€ 47.69
Totals	€ 740.96	€ 1,240.00	€ 739.06	€ 2,720.02	€ -	€ 2,956.80	€ 2,956.80	€ 1,907.66	€ 236.78	€ (715.31)

ABAB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 5 cm Thickness		€ 2.75	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		134.72	m^2
Total Wall Insulation Price		€ 370.48	
Windows		10	per house
Window Area		1.12	m^2 per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 956.30	
Surface Area of Roof		89.04362222	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		10.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ (84.47)	
IRR		3.26%	
B/C		0.92	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insul	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 370.48	€ 956.30	€ 739.06	€ 2,065.84	€ -	€ 118.27	€ 118.27	€ 114.05	€ (1,947.57)	€ (1,878.08)
2	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 109.98	€ 118.27	€ 109.98
3	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 106.06	€ 118.27	€ 106.06
4	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 102.27	€ 118.27	€ 102.27
5	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 98.63	€ 118.27	€ 98.63
6	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 95.11	€ 118.27	€ 95.11
7	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 91.71	€ 118.27	€ 91.71
8	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 88.44	€ 118.27	€ 88.44
9	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 85.29	€ 118.27	€ 85.29
10	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 82.24	€ 118.27	€ 82.24
11	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 79.31	€ 118.27	€ 79.31
12	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 76.48	€ 118.27	€ 76.48
13	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 73.75	€ 118.27	€ 73.75
14	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 71.12	€ 118.27	€ 71.12
15	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 68.58	€ 118.27	€ 68.58
16	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 66.13	€ 118.27	€ 66.13
17	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 63.77	€ 118.27	€ 63.77
18	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 61.50	€ 118.27	€ 61.50
19	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 59.30	€ 118.27	€ 59.30
20	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 57.19	€ 118.27	€ 57.19
21	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 55.15	€ 118.27	€ 55.15
22	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 53.18	€ 118.27	€ 53.18
23	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 51.28	€ 118.27	€ 51.28
24	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 49.45	€ 118.27	€ 49.45
25	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 47.69	€ 118.27	€ 47.69
Totals	€ 370.48	€ 956.30	€ 739.06	€ 2,065.84	€ -	€ 2,956.80	€ 2,956.80	€ 1,907.66	€ 890.96	€ (84.47)

ABBA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 740.96	
Windows		10	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 956.30	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		10.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 460.80	per year
Avoided Wood Consumption		€ 118.27	per year
NPV		€ (441.73)	
IRR		1.69%	
B/C		0.78	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 740.96	€ 956.30	€ 739.06	€ 2,436.32	€ -	€ 118.27	€ 118.27	€ 114.05	€ (2,318.05)	€ (2,235.34)
2	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 109.98	€ 118.27	€ 109.98
3	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 106.06	€ 118.27	€ 106.06
4	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 102.27	€ 118.27	€ 102.27
5	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 98.63	€ 118.27	€ 98.63
6	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 95.11	€ 118.27	€ 95.11
7	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 91.71	€ 118.27	€ 91.71
8	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 88.44	€ 118.27	€ 88.44
9	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 85.29	€ 118.27	€ 85.29
10	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 82.24	€ 118.27	€ 82.24
11	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 79.31	€ 118.27	€ 79.31
12	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 76.48	€ 118.27	€ 76.48
13	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 73.75	€ 118.27	€ 73.75
14	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 71.12	€ 118.27	€ 71.12
15	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 68.58	€ 118.27	€ 68.58
16	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 66.13	€ 118.27	€ 66.13
17	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 63.77	€ 118.27	€ 63.77
18	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 61.50	€ 118.27	€ 61.50
19	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 59.30	€ 118.27	€ 59.30
20	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 57.19	€ 118.27	€ 57.19
21	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 55.15	€ 118.27	€ 55.15
22	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 53.18	€ 118.27	€ 53.18
23	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 51.28	€ 118.27	€ 51.28
24	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 49.45	€ 118.27	€ 49.45
25	€ -	€ -	€ -	€ -	€ -	€ 118.27	€ 118.27	€ 47.69	€ 118.27	€ 47.69
Totals	€ 740.96	€ 956.30	€ 739.06	€ 2,436.32	€ -	€ 2,956.80	€ 2,956.80	€ 1,907.66	€ 520.48	€ (441.73)

ABBB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 370.48	
Windows		10	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		0	m³ per year
Price of wood		€ -	per m³
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ 52.63	
IRR		3.94%	
B/C		0.99	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefi	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 370.48	€ 1,240.00	€ 739.06	€ 2,349.54	€ 143.73	€ -	€ 143.73	€ 138.60	€ (2,205.81)	€ (2,127.11)
2	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 133.66	€ 143.73	€ 133.66
3	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 128.89	€ 143.73	€ 128.89
4	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 124.29	€ 143.73	€ 124.29
5	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 119.86	€ 143.73	€ 119.86
6	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 115.58	€ 143.73	€ 115.58
7	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 111.46	€ 143.73	€ 111.46
8	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 107.48	€ 143.73	€ 107.48
9	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 103.65	€ 143.73	€ 103.65
10	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 99.95	€ 143.73	€ 99.95
11	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 96.38	€ 143.73	€ 96.38
12	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 92.94	€ 143.73	€ 92.94
13	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 89.63	€ 143.73	€ 89.63
14	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 86.43	€ 143.73	€ 86.43
15	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 83.34	€ 143.73	€ 83.34
16	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 80.37	€ 143.73	€ 80.37
17	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 77.50	€ 143.73	€ 77.50
18	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 74.74	€ 143.73	€ 74.74
19	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 72.07	€ 143.73	€ 72.07
20	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 69.50	€ 143.73	€ 69.50
21	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 67.02	€ 143.73	€ 67.02
22	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 64.63	€ 143.73	€ 64.63
23	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 62.32	€ 143.73	€ 62.32
24	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 60.10	€ 143.73	€ 60.10
25	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 57.95	€ 143.73	€ 57.95
Totals	€ 370.48	€ 1,240.00	€ 739.06	€ 2,349.54	€ 3,593.33	€ -	€ 3,593.33	€ 2,318.34	€ 1,243.79	€ 52.63

ACAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 10 cm Thickness		€ 5.50	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		134.72	m^2
Total Wall Insulation Price		€ 740.96	
Windows		10	per house
Window Area		1.12	m^2 per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 1,240.00	
Surface Area of Roof		89.04362222	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		0	m^3 per year
Price of wood		€ -	per m^3
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ (304.63)	
IRR		2.48%	
B/C		0.85	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 740.96	€ 1,240.00	€ 739.06	€ 2,720.02	€ 143.73	€ -	€ 143.73	€ 138.60	€ (2,576.29)	€ (2,484.37)
2	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 133.66	€ 143.73	€ 133.66
3	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 128.89	€ 143.73	€ 128.89
4	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 124.29	€ 143.73	€ 124.29
5	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 119.86	€ 143.73	€ 119.86
6	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 115.58	€ 143.73	€ 115.58
7	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 111.46	€ 143.73	€ 111.46
8	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 107.48	€ 143.73	€ 107.48
9	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 103.65	€ 143.73	€ 103.65
10	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 99.95	€ 143.73	€ 99.95
11	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 96.38	€ 143.73	€ 96.38
12	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 92.94	€ 143.73	€ 92.94
13	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 89.63	€ 143.73	€ 89.63
14	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 86.43	€ 143.73	€ 86.43
15	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 83.34	€ 143.73	€ 83.34
16	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 80.37	€ 143.73	€ 80.37
17	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 77.50	€ 143.73	€ 77.50
18	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 74.74	€ 143.73	€ 74.74
19	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 72.07	€ 143.73	€ 72.07
20	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 69.50	€ 143.73	€ 69.50
21	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 67.02	€ 143.73	€ 67.02
22	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 64.63	€ 143.73	€ 64.63
23	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 62.32	€ 143.73	€ 62.32
24	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 60.10	€ 143.73	€ 60.10
25	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 57.95	€ 143.73	€ 57.95
Totals	€ 740.96	€ 1,240.00	€ 739.06	€ 2,720.02	€ 3,593.33	€ -	€ 3,593.33	€ 2,318.34	€ 873.31	€ (304.63)

ACAB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		148.406037	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		134.72	m²
Total Wall Insulation Price		€ 370.48	
Windows		10	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 956.30	
Surface Area of Roof		89.04362222	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 739.06	
Avrg Electricity Bill		€ 100.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 20.53	per month
Avrg Wood Consumption		0	m³ per year
Price of wood		€ -	per m³
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ 326.21	
IRR		5.32%	
B/C		1.12	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefi	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 370.48	€ 956.30	€ 739.06	€ 2,065.84	€ 143.73	€ -	€ 143.73	€ 138.60	€ (1,922.11)	€ (1,853.53)
2	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 133.66	€ 143.73	€ 133.66
3	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 128.89	€ 143.73	€ 128.89
4	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 124.29	€ 143.73	€ 124.29
5	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 119.86	€ 143.73	€ 119.86
6	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 115.58	€ 143.73	€ 115.58
7	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 111.46	€ 143.73	€ 111.46
8	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 107.48	€ 143.73	€ 107.48
9	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 103.65	€ 143.73	€ 103.65
10	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 99.95	€ 143.73	€ 99.95
11	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 96.38	€ 143.73	€ 96.38
12	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 92.94	€ 143.73	€ 92.94
13	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 89.63	€ 143.73	€ 89.63
14	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 86.43	€ 143.73	€ 86.43
15	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 83.34	€ 143.73	€ 83.34
16	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 80.37	€ 143.73	€ 80.37
17	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 77.50	€ 143.73	€ 77.50
18	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 74.74	€ 143.73	€ 74.74
19	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 72.07	€ 143.73	€ 72.07
20	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 69.50	€ 143.73	€ 69.50
21	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 67.02	€ 143.73	€ 67.02
22	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 64.63	€ 143.73	€ 64.63
23	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 62.32	€ 143.73	€ 62.32
24	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 60.10	€ 143.73	€ 60.10
25	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 57.95	€ 143.73	€ 57.95
Totals	€ 370.48	€ 956.30	€ 739.06	€ 2,065.84	€ 3,593.33	€ -	€ 3,593.33	€ 2,318.34	€ 1,527.49	€ 326.21

ACBA

Project Lifespan	25	years	
Lending Interest Rate	3.70%		
Surface Area of House	148.406037	m²	
Wall Insulation Price Price	0.55 for cm thick	per m²	
Price for 10 cm Thickness	€ 5.50	per m²	
Wall Insulation Durability	50	yrs	
Wall Area	145.92	m²	
Wall Area Without Windows	134.72	m²	
Total Wall Insulation Price	€ 740.96		
Windows	10	per house	
Window Area	1.12	m² per window	
Double Glazed Windows Price	95.63	per window	
Double Glazed W. Durability	30	yrs	
Total Double Glazed W. Price	€ 956.30		
Surface Area of Roof	89.04362222	m²	
Roof Insulation Price	8.3	per m²	
Roof Insulation Durability	50	yrs	
Total Roof Insulation Price	€ 739.06		
Avrg Electricity Bill	€ 100.00	per month	
Heating Contribution to Bill	80%		
Heating Loss from Walls	33%		
Heating Loss from Windows	18%		
Heating Loss from Roof	26%		
Total Heating Lost	25.67%		
Loss in Heating	€ 20.53	per month	
Avrg Wood Consumption	0	m³ per year	
Price of wood	€ -	per m³	
Valued Wood Consumption	€ -	per year	
Avoided Wood Consumption	€ -	per year	
NPV	€ (31.05)		
IRR	3.56%		
B/C	0.95		

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 740.96	€ 956.30	€ 739.06	€ 2,436.32	€ 143.73	€ -	€ 143.73	€ 138.60	€ (2,292.59)	€ (2,210.79)
2	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 133.66	€ 143.73	€ 133.66
3	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 128.89	€ 143.73	€ 128.89
4	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 124.29	€ 143.73	€ 124.29
5	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 119.86	€ 143.73	€ 119.86
6	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 115.58	€ 143.73	€ 115.58
7	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 111.46	€ 143.73	€ 111.46
8	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 107.48	€ 143.73	€ 107.48
9	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 103.65	€ 143.73	€ 103.65
10	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 99.95	€ 143.73	€ 99.95
11	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 96.38	€ 143.73	€ 96.38
12	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 92.94	€ 143.73	€ 92.94
13	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 89.63	€ 143.73	€ 89.63
14	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 86.43	€ 143.73	€ 86.43
15	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 83.34	€ 143.73	€ 83.34
16	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 80.37	€ 143.73	€ 80.37
17	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 77.50	€ 143.73	€ 77.50
18	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 74.74	€ 143.73	€ 74.74
19	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 72.07	€ 143.73	€ 72.07
20	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 69.50	€ 143.73	€ 69.50
21	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 67.02	€ 143.73	€ 67.02
22	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 64.63	€ 143.73	€ 64.63
23	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 62.32	€ 143.73	€ 62.32
24	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 60.10	€ 143.73	€ 60.10
25	€ -	€ -	€ -	€ -	€ 143.73	€ -	€ 143.73	€ 57.95	€ 143.73	€ 57.95
Totals	€ 740.96	€ 956.30	€ 739.06	€ 2,436.32	€ 3,593.33	€ -	€ 3,593.33	€ 2,318.34	€ 1,157.01	€ (31.05)

ACBB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 841.37	
Windows		30	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		20.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year
NPV		€ 3,271.80	
IRR		6.34%	
B/C		1.23	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefi	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 841.37	€ 3,720.00	€ 7,976.50	€ 12,537.87	€ 718.67	€ 233.77	€ 952.44	€ 918.46	€ (11,585.43)	€ (11,172.07)
2	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 885.69	€ 952.44	€ 885.69
3	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 854.08	€ 952.44	€ 854.08
4	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 823.61	€ 952.44	€ 823.61
5	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 794.22	€ 952.44	€ 794.22
6	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 765.89	€ 952.44	€ 765.89
7	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 738.56	€ 952.44	€ 738.56
8	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 712.21	€ 952.44	€ 712.21
9	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 686.80	€ 952.44	€ 686.80
10	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 662.29	€ 952.44	€ 662.29
11	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 638.66	€ 952.44	€ 638.66
12	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 615.87	€ 952.44	€ 615.87
13	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 593.90	€ 952.44	€ 593.90
14	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 572.71	€ 952.44	€ 572.71
15	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 552.28	€ 952.44	€ 552.28
16	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 532.57	€ 952.44	€ 532.57
17	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 513.57	€ 952.44	€ 513.57
18	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 495.24	€ 952.44	€ 495.24
19	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 477.57	€ 952.44	€ 477.57
20	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 460.53	€ 952.44	€ 460.53
21	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 444.10	€ 952.44	€ 444.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 428.26	€ 952.44	€ 428.26
23	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 412.98	€ 952.44	€ 412.98
24	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 398.24	€ 952.44	€ 398.24
25	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 384.03	€ 952.44	€ 384.03
Totals	€ 841.37	€ 3,720.00	€ 7,976.50	€ 12,537.87	€ 17,966.67	€ 5,844.30	€ 23,810.97	€ 15,362.33	€ 11,273.09	€ 3,271.80

BAAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 10 cm Thickness		€ 5.50	per m^2
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m^2
Wall Area Without Windows		305.9526469	m^2
Total Wall Insulation Price		€ 1,682.74	
Windows		30	per house
Window Area		1.12	m^2 per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		20.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year
NPV		€ 2,460.45	
IRR		5.58%	
B/C		1.15	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 1,682.74	€ 3,720.00	€ 7,976.50	€ 13,379.24	€ 718.67	€ 233.77	€ 952.44	€ 918.46	€ (12,426.80)	€ (11,983.42)
2	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 885.69	€ 952.44	€ 885.69
3	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 854.08	€ 952.44	€ 854.08
4	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 823.61	€ 952.44	€ 823.61
5	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 794.22	€ 952.44	€ 794.22
6	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 765.89	€ 952.44	€ 765.89
7	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 738.56	€ 952.44	€ 738.56
8	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 712.21	€ 952.44	€ 712.21
9	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 686.80	€ 952.44	€ 686.80
10	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 662.29	€ 952.44	€ 662.29
11	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 638.66	€ 952.44	€ 638.66
12	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 615.87	€ 952.44	€ 615.87
13	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 593.90	€ 952.44	€ 593.90
14	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 572.71	€ 952.44	€ 572.71
15	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 552.28	€ 952.44	€ 552.28
16	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 532.57	€ 952.44	€ 532.57
17	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 513.57	€ 952.44	€ 513.57
18	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 495.24	€ 952.44	€ 495.24
19	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 477.57	€ 952.44	€ 477.57
20	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 460.53	€ 952.44	€ 460.53
21	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 444.10	€ 952.44	€ 444.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 428.26	€ 952.44	€ 428.26
23	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 412.98	€ 952.44	€ 412.98
24	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 398.24	€ 952.44	€ 398.24
25	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 384.03	€ 952.44	€ 384.03
Totals	€ 1,682.74	€ 3,720.00	€ 7,976.50	€ 13,379.24	€ 17,966.67	€ 5,844.30	€ 23,810.97	€ 15,362.33	€ 10,431.73	€ 2,460.45

BAAB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 841.37	
Windows		30	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 2,868.90	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		20.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year
NPV		€ 4,092.54	
IRR		7.20%	
B/C		1.31	

Year	Wall Insulation Cost	Window Replacement Cos	Roof Insulation	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 841.37	€ 2,868.90	€ 7,976.50	€ 11,686.77	€ 718.67	€ 233.77	€ 952.44	€ 918.46	€ (10,734.33)	€ (10,351.33)
2	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 885.69	€ 952.44	€ 885.69
3	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 854.08	€ 952.44	€ 854.08
4	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 823.61	€ 952.44	€ 823.61
5	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 794.22	€ 952.44	€ 794.22
6	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 765.89	€ 952.44	€ 765.89
7	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 738.56	€ 952.44	€ 738.56
8	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 712.21	€ 952.44	€ 712.21
9	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 686.80	€ 952.44	€ 686.80
10	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 662.29	€ 952.44	€ 662.29
11	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 638.66	€ 952.44	€ 638.66
12	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 615.87	€ 952.44	€ 615.87
13	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 593.90	€ 952.44	€ 593.90
14	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 572.71	€ 952.44	€ 572.71
15	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 552.28	€ 952.44	€ 552.28
16	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 532.57	€ 952.44	€ 532.57
17	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 513.57	€ 952.44	€ 513.57
18	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 495.24	€ 952.44	€ 495.24
19	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 477.57	€ 952.44	€ 477.57
20	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 460.53	€ 952.44	€ 460.53
21	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 444.10	€ 952.44	€ 444.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 428.26	€ 952.44	€ 428.26
23	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 412.98	€ 952.44	€ 412.98
24	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 398.24	€ 952.44	€ 398.24
25	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 384.03	€ 952.44	€ 384.03
Totals	€ 841.37	€ 2,868.90	€ 7,976.50	€ 11,686.77	€ 17,966.67	€ 5,844.30	€ 23,810.97	€ 15,362.33	€ 12,124.19	€ 4,092.54

Payback Period		
12 years	3 months	9 days

BABA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 1,682.74	
Windows		30	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 2,868.90	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		20.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year
NPV		€ 3,281.19	
IRR		6.35%	
B/C		1.23	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 1,682.74	€ 2,868.90	€ 7,976.50	€ 12,528.14	€ 718.67	€ 233.77	€ 952.44	€ 918.46	€ (11,575.70)	€ (11,162.68)
2	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 885.69	€ 952.44	€ 885.69
3	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 854.08	€ 952.44	€ 854.08
4	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 823.61	€ 952.44	€ 823.61
5	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 794.22	€ 952.44	€ 794.22
6	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 765.89	€ 952.44	€ 765.89
7	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 738.56	€ 952.44	€ 738.56
8	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 712.21	€ 952.44	€ 712.21
9	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 686.80	€ 952.44	€ 686.80
10	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 662.29	€ 952.44	€ 662.29
11	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 638.66	€ 952.44	€ 638.66
12	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 615.87	€ 952.44	€ 615.87
13	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 593.90	€ 952.44	€ 593.90
14	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 572.71	€ 952.44	€ 572.71
15	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 552.28	€ 952.44	€ 552.28
16	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 532.57	€ 952.44	€ 532.57
17	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 513.57	€ 952.44	€ 513.57
18	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 495.24	€ 952.44	€ 495.24
19	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 477.57	€ 952.44	€ 477.57
20	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 460.53	€ 952.44	€ 460.53
21	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 444.10	€ 952.44	€ 444.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 428.26	€ 952.44	€ 428.26
23	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 412.98	€ 952.44	€ 412.98
24	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 398.24	€ 952.44	€ 398.24
25	€ -	€ -	€ -	€ -	€ 718.67	€ 233.77	€ 952.44	€ 384.03	€ 952.44	€ 384.03
Totals	€ 1,682.74	€ 2,868.90	€ 7,976.50	€ 12,528.14	€ 17,966.67	€ 5,844.30	€ 23,810.97	€ 15,362.33	€ 11,282.83	€ 3,281.19

BABB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 841.37	
Windows		30	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		-	per month
Heating Contribution to Bill		-	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		20.24	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year
NPV		€ (8,319.91)	
IRR		-5.52%	
B/C		0.30	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 841.37	€ 3,720.00	€ 7,976.50	€ 12,537.87	€ -	€ 233.77	€ 233.77	€ 225.43	€ (12,304.10)	€ (11,865.09)
2	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 217.39	€ 233.77	€ 217.39
3	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 209.63	€ 233.77	€ 209.63
4	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 202.15	€ 233.77	€ 202.15
5	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 194.94	€ 233.77	€ 194.94
6	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 187.98	€ 233.77	€ 187.98
7	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 181.28	€ 233.77	€ 181.28
8	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 174.81	€ 233.77	€ 174.81
9	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 168.57	€ 233.77	€ 168.57
10	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 162.56	€ 233.77	€ 162.56
11	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 156.76	€ 233.77	€ 156.76
12	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 151.16	€ 233.77	€ 151.16
13	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 145.77	€ 233.77	€ 145.77
14	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 140.57	€ 233.77	€ 140.57
15	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 135.55	€ 233.77	€ 135.55
16	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 130.72	€ 233.77	€ 130.72
17	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 126.05	€ 233.77	€ 126.05
18	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 121.56	€ 233.77	€ 121.56
19	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 117.22	€ 233.77	€ 117.22
20	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 113.04	€ 233.77	€ 113.04
21	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 109.00	€ 233.77	€ 109.00
22	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 105.11	€ 233.77	€ 105.11
23	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 101.36	€ 233.77	€ 101.36
24	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 97.75	€ 233.77	€ 97.75
25	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 94.26	€ 233.77	€ 94.26
Totals	€ 841.37	€ 3,720.00	€ 7,976.50	€ 12,537.87	€ -	€ 5,844.30	€ 5,844.30	€ 3,770.62	€ (6,693.57)	€ (8,319.91)

BBAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 10 cm Thickness		€ 5.50	per m^2
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m^2
Wall Area Without Windows		305.9526469	m^2
Total Wall Insulation Price		€ 1,682.74	
Windows		30	per house
Window Area		1.12	m^2 per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		20.24	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ 910.80	per year
Avoided Wood Consumption		€ 233.77	per year
NPV		€ (9,131.26)	
IRR		-5.93%	
B/C		0.28	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 1,682.74	€ 3,720.00	€ 7,976.50	€ 13,379.24	€ -	€ 233.77	€ 233.77	€ 225.43	€ (13,145.47)	€ (12,676.44)
2	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 217.39	€ 233.77	€ 217.39
3	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 209.63	€ 233.77	€ 209.63
4	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 202.15	€ 233.77	€ 202.15
5	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 194.94	€ 233.77	€ 194.94
6	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 187.98	€ 233.77	€ 187.98
7	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 181.28	€ 233.77	€ 181.28
8	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 174.81	€ 233.77	€ 174.81
9	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 168.57	€ 233.77	€ 168.57
10	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 162.56	€ 233.77	€ 162.56
11	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 156.76	€ 233.77	€ 156.76
12	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 151.16	€ 233.77	€ 151.16
13	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 145.77	€ 233.77	€ 145.77
14	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 140.57	€ 233.77	€ 140.57
15	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 135.55	€ 233.77	€ 135.55
16	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 130.72	€ 233.77	€ 130.72
17	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 126.05	€ 233.77	€ 126.05
18	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 121.56	€ 233.77	€ 121.56
19	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 117.22	€ 233.77	€ 117.22
20	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 113.04	€ 233.77	€ 113.04
21	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 109.00	€ 233.77	€ 109.00
22	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 105.11	€ 233.77	€ 105.11
23	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 101.36	€ 233.77	€ 101.36
24	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 97.75	€ 233.77	€ 97.75
25	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 94.26	€ 233.77	€ 94.26
Totals	€ 1,682.74	€ 3,720.00	€ 7,976.50	€ 13,379.24	€ -	€ 5,844.30	€ 5,844.30	€ 3,770.62	€ (7,534.94)	€ (9,131.26)

BBAB

Project Lifespan	25	years
Lending Interest Rate	3.70%	
Surface Area of House	2402.560832	m²
Wall Insulation Price Price	0.55 for cm thick	per m²
Price for 5 cm Thickness	€ 2.75	per m²
Wall Insulation Durability	50	yrs
Wall Area	339.5526469	m²
Wall Area Without Windows	305.9526469	m²
Total Wall Insulation Price	€ 841.37	
Windows	30	per house
Window Area	1.12	m² per window
Double Glazed Windows Price	95.63	per window
Double Glazed W. Durability	30	yrs
Total Double Glazed W. Price	€ 2,868.90	
Surface Area of Roof	961.0243326	m²
Roof Insulation Price	8.3	per m²
Roof Insulation Durability	50	yrs
Total Roof Insulation Price	€ 7,976.50	
Adjusted Electricity Bill	€ 500.00	per month
Heating Contribution to Bill	80%	
Heating Loss from Walls	33%	
Heating Loss from Windows	18%	
Heating Loss from Roof	26%	
Total Heating Lost	25.67%	
Loss in Heating	€ -	per month
Avrg Wood Consumption	20.24	m³ per year
Price of wood	€ 45.00	per m³
Valued Wood Consumption	€ 910.80	per year
Avoided Wood Consumption	€ 233.77	per year
NPV	€ (7,499.17)	
IRR	-5.06%	
B/C	0.32	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 841.37	€ 2,868.90	€ 7,976.50	€ 11,686.77	€ -	€ 233.77	€ 233.77	€ 225.43	€ (11,453.00)	€ (11,044.36)
2	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 217.39	€ 233.77	€ 217.39
3	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 209.63	€ 233.77	€ 209.63
4	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 202.15	€ 233.77	€ 202.15
5	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 194.94	€ 233.77	€ 194.94
6	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 187.98	€ 233.77	€ 187.98
7	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 181.28	€ 233.77	€ 181.28
8	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 174.81	€ 233.77	€ 174.81
9	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 168.57	€ 233.77	€ 168.57
10	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 162.56	€ 233.77	€ 162.56
11	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 156.76	€ 233.77	€ 156.76
12	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 151.16	€ 233.77	€ 151.16
13	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 145.77	€ 233.77	€ 145.77
14	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 140.57	€ 233.77	€ 140.57
15	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 135.55	€ 233.77	€ 135.55
16	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 130.72	€ 233.77	€ 130.72
17	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 126.05	€ 233.77	€ 126.05
18	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 121.56	€ 233.77	€ 121.56
19	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 117.22	€ 233.77	€ 117.22
20	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 113.04	€ 233.77	€ 113.04
21	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 109.00	€ 233.77	€ 109.00
22	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 105.11	€ 233.77	€ 105.11
23	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 101.36	€ 233.77	€ 101.36
24	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 97.75	€ 233.77	€ 97.75
25	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 94.26	€ 233.77	€ 94.26
Totals	€ 841.37	€ 2,868.90	€ 7,976.50	€ 11,686.77	€ -	€ 5,844.30	€ 5,844.30	€ 3,770.62	€ (5,842.47)	€ (7,499.17)

BBBA

Project Lifespan	25	years
Lending Interest Rate	3.70%	
Surface Area of House	2402.560832	m²
Wall Insulation Price Price	0.55 for cm thick	per m²
Price for 10 cm Thickness	€ 5.50	per m²
Wall Insulation Durability	50	yrs
Wall Area	339.5526469	m²
Wall Area Without Windows	305.9526469	m²
Total Wall Insulation Price	€ 1,682.74	
Windows	30	per house
Window Area	1.12	m² per window
Double Glazed Windows Price	95.63	per window
Double Glazed W. Durability	30	yrs
Total Double Glazed W. Price	€ 2,868.90	
Surface Area of Roof	961.0243326	m²
Roof Insulation Price	8.3	per m²
Roof Insulation Durability	50	yrs
Total Roof Insulation Price	€ 7,976.50	
Adjusted Electricity Bill	€ 500.00	per month
Heating Contribution to Bill	80%	
Heating Loss from Walls	33%	
Heating Loss from Windows	18%	
Heating Loss from Roof	26%	
Total Heating Lost	25.67%	
Loss in Heating	€ -	per month
Avrg Wood Consumption	20.24	m³ per year
Price of wood	€ 45.00	per m³
Valued Wood Consumption	€ 910.80	per year
Avoided Wood Consumption	€ 233.77	per year
NPV	€ (8,310.52)	
IRR	-5.51%	
B/C	0.30	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 1,682.74	€ 2,868.90	€ 7,976.50	€ 12,528.14	€ -	€ 233.77	€ 233.77	€ 225.43	€ (12,294.37)	€ (11,855.71)
2	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 217.39	€ 233.77	€ 217.39
3	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 209.63	€ 233.77	€ 209.63
4	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 202.15	€ 233.77	€ 202.15
5	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 194.94	€ 233.77	€ 194.94
6	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 187.98	€ 233.77	€ 187.98
7	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 181.28	€ 233.77	€ 181.28
8	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 174.81	€ 233.77	€ 174.81
9	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 168.57	€ 233.77	€ 168.57
10	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 162.56	€ 233.77	€ 162.56
11	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 156.76	€ 233.77	€ 156.76
12	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 151.16	€ 233.77	€ 151.16
13	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 145.77	€ 233.77	€ 145.77
14	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 140.57	€ 233.77	€ 140.57
15	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 135.55	€ 233.77	€ 135.55
16	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 130.72	€ 233.77	€ 130.72
17	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 126.05	€ 233.77	€ 126.05
18	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 121.56	€ 233.77	€ 121.56
19	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 117.22	€ 233.77	€ 117.22
20	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 113.04	€ 233.77	€ 113.04
21	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 109.00	€ 233.77	€ 109.00
22	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 105.11	€ 233.77	€ 105.11
23	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 101.36	€ 233.77	€ 101.36
24	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 97.75	€ 233.77	€ 97.75
25	€ -	€ -	€ -	€ -	€ -	€ 233.77	€ 233.77	€ 94.26	€ 233.77	€ 94.26
Totals	€ 1,682.74	€ 2,868.90	€ 7,976.50	€ 12,528.14	€ -	€ 5,844.30	€ 5,844.30	€ 3,770.62	€ (6,683.84)	€ (8,310.52)

BBBB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 841.37	
Windows		30	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		0	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ (498.81)	
IRR		3.27%	
B/C		0.92	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 841.37	€ 3,720.00	€ 7,976.50	€ 12,537.87	€ 718.67	€ -	€ 718.67	€ 693.02	€ (11,819.21)	€ (11,397.50)
2	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 668.30	€ 718.67	€ 668.30
3	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 644.45	€ 718.67	€ 644.45
4	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 621.46	€ 718.67	€ 621.46
5	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 599.29	€ 718.67	€ 599.29
6	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 577.90	€ 718.67	€ 577.90
7	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 557.28	€ 718.67	€ 557.28
8	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 537.40	€ 718.67	€ 537.40
9	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 518.23	€ 718.67	€ 518.23
10	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 499.74	€ 718.67	€ 499.74
11	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 481.90	€ 718.67	€ 481.90
12	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 464.71	€ 718.67	€ 464.71
13	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 448.13	€ 718.67	€ 448.13
14	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 432.14	€ 718.67	€ 432.14
15	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 416.72	€ 718.67	€ 416.72
16	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 401.85	€ 718.67	€ 401.85
17	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 387.52	€ 718.67	€ 387.52
18	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 373.69	€ 718.67	€ 373.69
19	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 360.36	€ 718.67	€ 360.36
20	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 347.50	€ 718.67	€ 347.50
21	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 335.10	€ 718.67	€ 335.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 323.14	€ 718.67	€ 323.14
23	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 311.61	€ 718.67	€ 311.61
24	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 300.50	€ 718.67	€ 300.50
25	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 289.77	€ 718.67	€ 289.77
Totals	€ 841.37	€ 3,720.00	€ 7,976.50	€ 12,537.87	€ 17,966.67	€ -	€ 17,966.67	€ 11,591.71	€ 5,428.79	€ (498.81)

BCAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		2402.560832	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		339.5526469	m²
Wall Area Without Windows		305.9526469	m²
Total Wall Insulation Price		€ 1,682.74	
Windows		30	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 3,720.00	
Surface Area of Roof		961.0243326	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 7,976.50	
Adjusted Electricity Bill		€ 500.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 102.67	per month
Avrg Wood Consumption		0	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ (1,310.16)	
IRR		2.64%	
B/C		0.87	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 1,682.74	€ 3,720.00	€ 7,976.50	€ 13,379.24	€ 718.67	€ -	€ 718.67	€ 693.02	€ (12,660.57)	€ (12,208.85)
2	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 668.30	€ 718.67	€ 668.30
3	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 644.45	€ 718.67	€ 644.45
4	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 621.46	€ 718.67	€ 621.46
5	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 599.29	€ 718.67	€ 599.29
6	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 577.90	€ 718.67	€ 577.90
7	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 557.28	€ 718.67	€ 557.28
8	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 537.40	€ 718.67	€ 537.40
9	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 518.23	€ 718.67	€ 518.23
10	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 499.74	€ 718.67	€ 499.74
11	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 481.90	€ 718.67	€ 481.90
12	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 464.71	€ 718.67	€ 464.71
13	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 448.13	€ 718.67	€ 448.13
14	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 432.14	€ 718.67	€ 432.14
15	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 416.72	€ 718.67	€ 416.72
16	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 401.85	€ 718.67	€ 401.85
17	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 387.52	€ 718.67	€ 387.52
18	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 373.69	€ 718.67	€ 373.69
19	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 360.36	€ 718.67	€ 360.36
20	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 347.50	€ 718.67	€ 347.50
21	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 335.10	€ 718.67	€ 335.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 323.14	€ 718.67	€ 323.14
23	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 311.61	€ 718.67	€ 311.61
24	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 300.50	€ 718.67	€ 300.50
25	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 289.77	€ 718.67	€ 289.77
Totals	€ 1,682.74	€ 3,720.00	€ 7,976.50	€ 13,379.24	€ 17,966.67	€ -	€ 17,966.67	€ 11,591.71	€ 4,587.43	€ (1,310.16)

BCAB

Project Lifespan	25	years	
Lending Interest Rate	3.70%		
Surface Area of House	2402.560832	m²	
Wall Insulation Price Price	0.55 for cm thick	per m²	
Price for 5 cm Thickness	€ 2.75	per m²	
Wall Insulation Durability	50	yrs	
Wall Area	339.5526469	m²	
Wall Area Without Windows	305.9526469	m²	
Total Wall Insulation Price	€ 841.37		
Windows	30	per house	
Window Area	1.12	m² per window	
Double Glazed Windows Price	95.63	per window	
Double Glazed W. Durability	30	yrs	
Total Double Glazed W. Price	€ 2,868.90		
Surface Area of Roof	961.0243326	m²	
Roof Insulation Price	8.3	per m²	
Roof Insulation Durability	50	yrs	
Total Roof Insulation Price	€ 7,976.50		
Adjusted Electricity Bill	€ 500.00	per month	
Heating Contribution to Bill	80%		
Heating Loss from Walls	33%		
Heating Loss from Windows	18%		
Heating Loss from Roof	26%		
Total Heating Lost	25.67%		
Loss in Heating	€ 102.67	per month	
Avrg Wood Consumption	0	m³ per year	
Price of wood	€ 45.00	per m³	
Valued Wood Consumption	€ -	per year	
Avoided Wood Consumption	€ -	per year	
NPV	€ 321.92		
IRR	3.99%		
B/C	0.99		

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 841.37	€ 2,868.90	€ 7,976.50	€ 11,686.77	€ 718.67	€ -	€ 718.67	€ 693.02	€ (10,968.11)	€ (10,576.76)
2	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 668.30	€ 718.67	€ 668.30
3	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 644.45	€ 718.67	€ 644.45
4	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 621.46	€ 718.67	€ 621.46
5	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 599.29	€ 718.67	€ 599.29
6	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 577.90	€ 718.67	€ 577.90
7	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 557.28	€ 718.67	€ 557.28
8	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 537.40	€ 718.67	€ 537.40
9	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 518.23	€ 718.67	€ 518.23
10	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 499.74	€ 718.67	€ 499.74
11	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 481.90	€ 718.67	€ 481.90
12	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 464.71	€ 718.67	€ 464.71
13	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 448.13	€ 718.67	€ 448.13
14	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 432.14	€ 718.67	€ 432.14
15	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 416.72	€ 718.67	€ 416.72
16	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 401.85	€ 718.67	€ 401.85
17	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 387.52	€ 718.67	€ 387.52
18	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 373.69	€ 718.67	€ 373.69
19	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 360.36	€ 718.67	€ 360.36
20	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 347.50	€ 718.67	€ 347.50
21	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 335.10	€ 718.67	€ 335.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 323.14	€ 718.67	€ 323.14
23	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 311.61	€ 718.67	€ 311.61
24	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 300.50	€ 718.67	€ 300.50
25	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 289.77	€ 718.67	€ 289.77
Totals	€ 841.37	€ 2,868.90	€ 7,976.50	€ 11,686.77	€ 17,966.67	€ -	€ 17,966.67	€ 11,591.71	€ 6,279.89	€ 321.92

BCBA

Project Lifespan	25	years
Lending Interest Rate	3.70%	
Surface Area of House	2402.560832	m²
Wall Insulation Price Price	0.55 for cm thick	per m²
Price for 10 cm Thickness	€ 5.50	per m²
Wall Insulation Durability	50	yrs
Wall Area	339.5526469	m²
Wall Area Without Windows	305.9526469	m²
Total Wall Insulation Price	€ 1,682.74	
Windows	30	per house
Window Area	1.12	m² per window
Double Glazed Windows Price	95.63	per window
Double Glazed W. Durability	30	yrs
Total Double Glazed W. Price	€ 2,868.90	
Surface Area of Roof	961.0243326	m²
Roof Insulation Price	8.3	per m²
Roof Insulation Durability	50	yrs
Total Roof Insulation Price	€ 7,976.50	
Adjusted Electricity Bill	€ 500.00	per month
Heating Contribution to Bill	80%	
Heating Loss from Walls	33%	
Heating Loss from Windows	18%	
Heating Loss from Roof	26%	
Total Heating Lost	25.67%	
Loss in Heating	€ 102.67	per month
Avrg Wood Consumption	0	m³ per year
Price of wood	€ 45.00	per m³
Valued Wood Consumption	€ -	per year
Avoided Wood Consumption	€ -	per year
NPV	€ (489.43)	
IRR	3.28%	
B/C	0.93	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 1,682.74	€ 2,868.90	€ 7,976.50	€ 12,528.14	€ 718.67	€ -	€ 718.67	€ 693.02	€ (11,809.47)	€ (11,388.11)
2	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 668.30	€ 718.67	€ 668.30
3	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 644.45	€ 718.67	€ 644.45
4	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 621.46	€ 718.67	€ 621.46
5	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 599.29	€ 718.67	€ 599.29
6	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 577.90	€ 718.67	€ 577.90
7	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 557.28	€ 718.67	€ 557.28
8	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 537.40	€ 718.67	€ 537.40
9	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 518.23	€ 718.67	€ 518.23
10	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 499.74	€ 718.67	€ 499.74
11	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 481.90	€ 718.67	€ 481.90
12	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 464.71	€ 718.67	€ 464.71
13	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 448.13	€ 718.67	€ 448.13
14	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 432.14	€ 718.67	€ 432.14
15	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 416.72	€ 718.67	€ 416.72
16	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 401.85	€ 718.67	€ 401.85
17	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 387.52	€ 718.67	€ 387.52
18	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 373.69	€ 718.67	€ 373.69
19	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 360.36	€ 718.67	€ 360.36
20	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 347.50	€ 718.67	€ 347.50
21	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 335.10	€ 718.67	€ 335.10
22	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 323.14	€ 718.67	€ 323.14
23	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 311.61	€ 718.67	€ 311.61
24	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 300.50	€ 718.67	€ 300.50
25	€ -	€ -	€ -	€ -	€ 718.67	€ -	€ 718.67	€ 289.77	€ 718.67	€ 289.77
Totals	€ 1,682.74	€ 2,868.90	€ 7,976.50	€ 12,528.14	€ 17,966.67	€ -	€ 17,966.67	€ 11,591.71	€ 5,438.53	€ (489.43)

BCBB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 382.80	
Windows		6	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 744.00	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 4.11	per month
Avrg Wood Consumption		4	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 180.00	per year
Avoided Wood Consumption		€ 46.20	per year
NPV		€ (81.25)	
IRR		3.05%	
B/C		0.90	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 382.80	€ 744.00	€ 211.03	€ 1,337.83	€ 28.75	€ 46.20	€ 74.95	€ 72.27	€ (1,262.89)	€ (1,217.83)
2	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 69.69	€ 74.95	€ 69.69
3	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 67.21	€ 74.95	€ 67.21
4	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 64.81	€ 74.95	€ 64.81
5	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 62.50	€ 74.95	€ 62.50
6	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 60.27	€ 74.95	€ 60.27
7	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 58.12	€ 74.95	€ 58.12
8	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 56.04	€ 74.95	€ 56.04
9	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 54.04	€ 74.95	€ 54.04
10	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 52.12	€ 74.95	€ 52.12
11	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 50.26	€ 74.95	€ 50.26
12	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 48.46	€ 74.95	€ 48.46
13	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 46.73	€ 74.95	€ 46.73
14	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 45.07	€ 74.95	€ 45.07
15	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 43.46	€ 74.95	€ 43.46
16	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 41.91	€ 74.95	€ 41.91
17	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 40.41	€ 74.95	€ 40.41
18	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 38.97	€ 74.95	€ 38.97
19	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 37.58	€ 74.95	€ 37.58
20	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 36.24	€ 74.95	€ 36.24
21	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 34.95	€ 74.95	€ 34.95
22	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 33.70	€ 74.95	€ 33.70
23	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 32.50	€ 74.95	€ 32.50
24	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 31.34	€ 74.95	€ 31.34
25	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 30.22	€ 74.95	€ 30.22
Totals	€ 382.80	€ 744.00	€ 211.03	€ 1,337.83	€ 718.67	€ 1,155.00	€ 1,873.67	€ 1,208.85	€ 535.83	€ (81.25)

CAAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 765.60	
Windows		6	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 744.00	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 4.11	per month
Avrg Wood Consumption		4	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 180.00	per year
Avoided Wood Consumption		€ 46.20	per year
NPV		€ (450.39)	
IRR		0.72%	
B/C		0.70	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 765.60	€ 744.00	€ 211.03	€ 1,720.63	€ 28.75	€ 46.20	€ 74.95	€ 72.27	€ (1,645.69)	€ (1,586.97)
2	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 69.69	€ 74.95	€ 69.69
3	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 67.21	€ 74.95	€ 67.21
4	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 64.81	€ 74.95	€ 64.81
5	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 62.50	€ 74.95	€ 62.50
6	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 60.27	€ 74.95	€ 60.27
7	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 58.12	€ 74.95	€ 58.12
8	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 56.04	€ 74.95	€ 56.04
9	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 54.04	€ 74.95	€ 54.04
10	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 52.12	€ 74.95	€ 52.12
11	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 50.26	€ 74.95	€ 50.26
12	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 48.46	€ 74.95	€ 48.46
13	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 46.73	€ 74.95	€ 46.73
14	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 45.07	€ 74.95	€ 45.07
15	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 43.46	€ 74.95	€ 43.46
16	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 41.91	€ 74.95	€ 41.91
17	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 40.41	€ 74.95	€ 40.41
18	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 38.97	€ 74.95	€ 38.97
19	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 37.58	€ 74.95	€ 37.58
20	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 36.24	€ 74.95	€ 36.24
21	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 34.95	€ 74.95	€ 34.95
22	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 33.70	€ 74.95	€ 33.70
23	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 32.50	€ 74.95	€ 32.50
24	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 31.34	€ 74.95	€ 31.34
25	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 30.22	€ 74.95	€ 30.22
Totals	€ 765.60	€ 744.00	€ 211.03	€ 1,720.63	€ 718.67	€ 1,155.00	€ 1,873.67	€ 1,208.85	€ 153.03	€ (450.39)

CAAB

Project Lifespan	25	years	
Lending Interest Rate	3.70%		
Surface Area of House	21.1882366	m²	
Wall Insulation Price Price	0.55 for cm thick	per m²	
Price for 5 cm Thickness	€ 2.75	per m²	
Wall Insulation Durability	50	yrs	
Wall Area	145.92	m²	
Wall Area Without Windows	139.2	m²	
Total Wall Insulation Price	€ 382.80		
Windows	6	per house	
Window Area	1.12	m² per window	
Double Glazed Windows Price	95.63	per window	
Double Glazed W. Durability	30	yrs	
Total Double Glazed W. Price	€ 573.78		
Surface Area of Roof	25.42588391	m²	
Roof Insulation Price	8.3	per m²	
Roof Insulation Durability	50	yrs	
Total Roof Insulation Price	€ 211.03		
Adjusted Electricity Bill	€ 20.00	per month	
Heating Contribution to Bill	80%		
Heating Loss from Walls	33%		
Heating Loss from Windows	18%		
Heating Loss from Roof	26%		
Total Heating Lost	25.67%		
Loss in Heating	€ 4.11	per month	
Avrg Wood Consumption	4	m³ per year	
Price of wood	€ 45.00	per m³	
Valued Wood Consumption	€ 180.00	per year	
Avoided Wood Consumption	€ 46.20	per year	
NPV	€ 82.90		
IRR	4.44%		
B/C	1.04		

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 382.80	€ 573.78	€ 211.03	€ 1,167.61	€ 28.75	€ 46.20	€ 74.95	€ 72.27	€ (1,092.67)	€ (1,053.68)
2	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 69.69	€ 74.95	€ 69.69
3	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 67.21	€ 74.95	€ 67.21
4	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 64.81	€ 74.95	€ 64.81
5	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 62.50	€ 74.95	€ 62.50
6	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 60.27	€ 74.95	€ 60.27
7	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 58.12	€ 74.95	€ 58.12
8	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 56.04	€ 74.95	€ 56.04
9	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 54.04	€ 74.95	€ 54.04
10	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 52.12	€ 74.95	€ 52.12
11	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 50.26	€ 74.95	€ 50.26
12	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 48.46	€ 74.95	€ 48.46
13	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 46.73	€ 74.95	€ 46.73
14	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 45.07	€ 74.95	€ 45.07
15	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 43.46	€ 74.95	€ 43.46
16	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 41.91	€ 74.95	€ 41.91
17	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 40.41	€ 74.95	€ 40.41
18	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 38.97	€ 74.95	€ 38.97
19	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 37.58	€ 74.95	€ 37.58
20	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 36.24	€ 74.95	€ 36.24
21	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 34.95	€ 74.95	€ 34.95
22	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 33.70	€ 74.95	€ 33.70
23	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 32.50	€ 74.95	€ 32.50
24	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 31.34	€ 74.95	€ 31.34
25	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 30.22	€ 74.95	€ 30.22
Totals	€ 382.80	€ 573.78	€ 211.03	€ 1,167.61	€ 718.67	€ 1,155.00	€ 1,873.67	€ 1,208.85	€ 706.05	€ 82.90

Payback Period		
15 years	6 months	30 days

CABA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 10 cm Thickness	€	5.50	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		139.2	m^2
Total Wall Insulation Price	€	765.60	
Windows		6	per house
Window Area		1.12	m^2 per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price	€	573.78	
Surface Area of Roof		25.42588391	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price	€	211.03	
Adjusted Electricity Bill	€	20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating	€	4.11	per month
Avrg Wood Consumption		4	m^3 per year
Price of wood	€	45.00	per m^3
Valued Wood Consumption	€	180.00	per year
Avoided Wood Consumption	€	46.20	per year
NPV	€	(286.25)	
IRR		1.65%	
B/C		0.78	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 765.60	€ 573.78	€ 211.03	€ 1,550.41	€ 28.75	€ 46.20	€ 74.95	€ 72.27	€ (1,475.47)	€ (1,422.82)
2	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 69.69	€ 74.95	€ 69.69
3	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 67.21	€ 74.95	€ 67.21
4	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 64.81	€ 74.95	€ 64.81
5	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 62.50	€ 74.95	€ 62.50
6	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 60.27	€ 74.95	€ 60.27
7	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 58.12	€ 74.95	€ 58.12
8	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 56.04	€ 74.95	€ 56.04
9	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 54.04	€ 74.95	€ 54.04
10	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 52.12	€ 74.95	€ 52.12
11	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 50.26	€ 74.95	€ 50.26
12	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 48.46	€ 74.95	€ 48.46
13	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 46.73	€ 74.95	€ 46.73
14	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 45.07	€ 74.95	€ 45.07
15	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 43.46	€ 74.95	€ 43.46
16	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 41.91	€ 74.95	€ 41.91
17	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 40.41	€ 74.95	€ 40.41
18	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 38.97	€ 74.95	€ 38.97
19	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 37.58	€ 74.95	€ 37.58
20	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 36.24	€ 74.95	€ 36.24
21	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 34.95	€ 74.95	€ 34.95
22	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 33.70	€ 74.95	€ 33.70
23	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 32.50	€ 74.95	€ 32.50
24	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 31.34	€ 74.95	€ 31.34
25	€ -	€ -	€ -	€ -	€ 28.75	€ 46.20	€ 74.95	€ 30.22	€ 74.95	€ 30.22
Totals	€ 765.60	€ 573.78	€ 211.03	€ 1,550.41	€ 718.67	€ 1,155.00	€ 1,873.67	€ 1,208.85	€ 323.25	€ (286.25)

CABB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 382.80	
Windows		6	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 744.00	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		4	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 180.00	per year
Avoided Wood Consumption		€ 46.20	per year
NPV		€ (544.92)	
IRR		-1.19%	
B/C		0.56	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 382.80	€ 744.00	€ 211.03	€ 1,337.83	€ -	€ 46.20	€ 46.20	€ 44.55	€ (1,291.63)	€ (1,245.55)
2	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 42.96	€ 46.20	€ 42.96
3	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 41.43	€ 46.20	€ 41.43
4	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 39.95	€ 46.20	€ 39.95
5	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 38.53	€ 46.20	€ 38.53
6	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 37.15	€ 46.20	€ 37.15
7	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 35.83	€ 46.20	€ 35.83
8	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 34.55	€ 46.20	€ 34.55
9	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 33.31	€ 46.20	€ 33.31
10	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 32.13	€ 46.20	€ 32.13
11	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 30.98	€ 46.20	€ 30.98
12	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 29.87	€ 46.20	€ 29.87
13	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 28.81	€ 46.20	€ 28.81
14	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 27.78	€ 46.20	€ 27.78
15	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 26.79	€ 46.20	€ 26.79
16	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 25.83	€ 46.20	€ 25.83
17	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.91	€ 46.20	€ 24.91
18	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.02	€ 46.20	€ 24.02
19	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 23.17	€ 46.20	€ 23.17
20	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 22.34	€ 46.20	€ 22.34
21	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 21.54	€ 46.20	€ 21.54
22	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.77	€ 46.20	€ 20.77
23	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.03	€ 46.20	€ 20.03
24	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 19.32	€ 46.20	€ 19.32
25	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 18.63	€ 46.20	€ 18.63
Totals	€ 382.80	€ 744.00	€ 211.03	€ 1,337.83	€ -	€ 1,155.00	€ 1,155.00	€ 745.18	€ (182.83)	€ (544.92)

CBAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 765.60	
Windows		6	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 744.00	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		4	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 180.00	per year
Avoided Wood Consumption		€ 46.20	per year
NPV		€ (914.06)	
IRR		-3.06%	
B/C		0.43	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 765.60	€ 744.00	€ 211.03	€ 1,720.63	€ -	€ 46.20	€ 46.20	€ 44.55	€ (1,674.43)	€ (1,614.69)
2	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 42.96	€ 46.20	€ 42.96
3	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 41.43	€ 46.20	€ 41.43
4	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 39.95	€ 46.20	€ 39.95
5	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 38.53	€ 46.20	€ 38.53
6	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 37.15	€ 46.20	€ 37.15
7	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 35.83	€ 46.20	€ 35.83
8	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 34.55	€ 46.20	€ 34.55
9	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 33.31	€ 46.20	€ 33.31
10	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 32.13	€ 46.20	€ 32.13
11	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 30.98	€ 46.20	€ 30.98
12	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 29.87	€ 46.20	€ 29.87
13	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 28.81	€ 46.20	€ 28.81
14	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 27.78	€ 46.20	€ 27.78
15	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 26.79	€ 46.20	€ 26.79
16	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 25.83	€ 46.20	€ 25.83
17	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.91	€ 46.20	€ 24.91
18	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.02	€ 46.20	€ 24.02
19	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 23.17	€ 46.20	€ 23.17
20	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 22.34	€ 46.20	€ 22.34
21	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 21.54	€ 46.20	€ 21.54
22	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.77	€ 46.20	€ 20.77
23	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.03	€ 46.20	€ 20.03
24	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 19.32	€ 46.20	€ 19.32
25	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 18.63	€ 46.20	€ 18.63
Totals	€ 765.60	€ 744.00	€ 211.03	€ 1,720.63	€ -	€ 1,155.00	€ 1,155.00	€ 745.18	€ (565.63)	€ (914.06)

CBAB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 5 cm Thickness		€ 2.75	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 382.80	
Windows		6	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 573.78	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		4	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 180.00	per year
Avoided Wood Consumption		€ 46.20	per year
NPV		€ (380.77)	
IRR		-0.09%	
B/C		0.64	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 382.80	€ 573.78	€ 211.03	€ 1,167.61	€ -	€ 46.20	€ 46.20	€ 44.55	€ (1,121.41)	€ (1,081.40)
2	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 42.96	€ 46.20	€ 42.96
3	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 41.43	€ 46.20	€ 41.43
4	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 39.95	€ 46.20	€ 39.95
5	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 38.53	€ 46.20	€ 38.53
6	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 37.15	€ 46.20	€ 37.15
7	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 35.83	€ 46.20	€ 35.83
8	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 34.55	€ 46.20	€ 34.55
9	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 33.31	€ 46.20	€ 33.31
10	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 32.13	€ 46.20	€ 32.13
11	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 30.98	€ 46.20	€ 30.98
12	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 29.87	€ 46.20	€ 29.87
13	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 28.81	€ 46.20	€ 28.81
14	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 27.78	€ 46.20	€ 27.78
15	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 26.79	€ 46.20	€ 26.79
16	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 25.83	€ 46.20	€ 25.83
17	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.91	€ 46.20	€ 24.91
18	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.02	€ 46.20	€ 24.02
19	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 23.17	€ 46.20	€ 23.17
20	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 22.34	€ 46.20	€ 22.34
21	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 21.54	€ 46.20	€ 21.54
22	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.77	€ 46.20	€ 20.77
23	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.03	€ 46.20	€ 20.03
24	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 19.32	€ 46.20	€ 19.32
25	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 18.63	€ 46.20	€ 18.63
Totals	€ 382.80	€ 573.78	€ 211.03	€ 1,167.61	€ -	€ 1,155.00	€ 1,155.00	€ 745.18	€ (12.61)	€ (380.77)

CBBA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 765.60	
Windows		6	per house
Window Area		1.12	m² per window
Double Glazed Windows Price		95.63	per window
Double Glazed W. Durability		30	yrs
Total Double Glazed W. Price		€ 573.78	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ -	per month
Avrg Wood Consumption		4	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ 180.00	per year
Avoided Wood Consumption		€ 46.20	per year
NPV		€ (749.92)	
IRR		-2.31%	
B/C		0.48	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 765.60	€ 573.78	€ 211.03	€ 1,550.41	€ -	€ 46.20	€ 46.20	€ 44.55	€ (1,504.21)	€ (1,450.54)
2	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 42.96	€ 46.20	€ 42.96
3	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 41.43	€ 46.20	€ 41.43
4	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 39.95	€ 46.20	€ 39.95
5	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 38.53	€ 46.20	€ 38.53
6	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 37.15	€ 46.20	€ 37.15
7	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 35.83	€ 46.20	€ 35.83
8	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 34.55	€ 46.20	€ 34.55
9	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 33.31	€ 46.20	€ 33.31
10	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 32.13	€ 46.20	€ 32.13
11	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 30.98	€ 46.20	€ 30.98
12	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 29.87	€ 46.20	€ 29.87
13	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 28.81	€ 46.20	€ 28.81
14	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 27.78	€ 46.20	€ 27.78
15	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 26.79	€ 46.20	€ 26.79
16	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 25.83	€ 46.20	€ 25.83
17	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.91	€ 46.20	€ 24.91
18	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 24.02	€ 46.20	€ 24.02
19	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 23.17	€ 46.20	€ 23.17
20	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 22.34	€ 46.20	€ 22.34
21	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 21.54	€ 46.20	€ 21.54
22	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.77	€ 46.20	€ 20.77
23	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 20.03	€ 46.20	€ 20.03
24	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 19.32	€ 46.20	€ 19.32
25	€ -	€ -	€ -	€ -	€ -	€ 46.20	€ 46.20	€ 18.63	€ 46.20	€ 18.63
Totals	€ 765.60	€ 573.78	€ 211.03	€ 1,550.41	€ -	€ 1,155.00	€ 1,155.00	€ 745.18	€ (395.41)	€ (749.92)

CBBB

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m^2
Wall Insulation Price Price		0.55 for cm thick	per m^2
Price for 5 cm Thickness		€ 2.75	per m^2
Wall Insulation Durability		50	yrs
Wall Area		145.92	m^2
Wall Area Without Windows		139.2	m^2
Total Wall Insulation Price		€ 382.80	
Windows		6	per house
Window Area		1.12	m^2 per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 744.00	
Surface Area of Roof		25.42588391	m^2
Roof Insulation Price		8.3	per m^2
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 4.11	per month
Avrg Wood Consumption		0	m^3 per year
Price of wood		€ 45.00	per m^3
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ (826.43)	
IRR		-4.60%	
B/C		0.35	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 382.80	€ 744.00	€ 211.03	€ 1,337.83	€ 28.75	€ -	€ 28.75	€ 27.72	€ (1,309.09)	€ (1,262.38)
2	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 26.73	€ 28.75	€ 26.73
3	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 25.78	€ 28.75	€ 25.78
4	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 24.86	€ 28.75	€ 24.86
5	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.97	€ 28.75	€ 23.97
6	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.12	€ 28.75	€ 23.12
7	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 22.29	€ 28.75	€ 22.29
8	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 21.50	€ 28.75	€ 21.50
9	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 20.73	€ 28.75	€ 20.73
10	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.99	€ 28.75	€ 19.99
11	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.28	€ 28.75	€ 19.28
12	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 18.59	€ 28.75	€ 18.59
13	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.93	€ 28.75	€ 17.93
14	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.29	€ 28.75	€ 17.29
15	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.67	€ 28.75	€ 16.67
16	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.07	€ 28.75	€ 16.07
17	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 15.50	€ 28.75	€ 15.50
18	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.95	€ 28.75	€ 14.95
19	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.41	€ 28.75	€ 14.41
20	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.90	€ 28.75	€ 13.90
21	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.40	€ 28.75	€ 13.40
22	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.93	€ 28.75	€ 12.93
23	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.46	€ 28.75	€ 12.46
24	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.02	€ 28.75	€ 12.02
25	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 11.59	€ 28.75	€ 11.59
Totals	€ 382.80	€ 744.00	€ 211.03	€ 1,337.83	€ 718.67	€ -	€ 718.67	€ 463.67	€ (619.17)	€ (826.43)

CCAA

Project Lifespan		25	years
Lending Interest Rate		3.70%	
Surface Area of House		21.1882366	m²
Wall Insulation Price Price		0.55 for cm thick	per m²
Price for 10 cm Thickness		€ 5.50	per m²
Wall Insulation Durability		50	yrs
Wall Area		145.92	m²
Wall Area Without Windows		139.2	m²
Total Wall Insulation Price		€ 765.60	
Windows		6	per house
Window Area		1.12	m² per window
Triple Glazed Windows Price		124	per window
Triple Glazed W. Durability		30	yrs
Total Triple Glazed W. Price		€ 744.00	
Surface Area of Roof		25.42588391	m²
Roof Insulation Price		8.3	per m²
Roof Insulation Durability		50	yrs
Total Roof Insulation Price		€ 211.03	
Adjusted Electricity Bill		€ 20.00	per month
Heating Contribution to Bill		80%	
Heating Loss from Walls		33%	
Heating Loss from Windows		18%	
Heating Loss from Roof		26%	
Total Heating Lost		25.67%	
Loss in Heating		€ 4.11	per month
Avrg Wood Consumption		0	m³ per year
Price of wood		€ 45.00	per m³
Valued Wood Consumption		€ -	per year
Avoided Wood Consumption		€ -	per year
NPV		€ (1,195.57)	
IRR		-6.20%	
B/C		0.27	

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefits	Cash Flow	Discounted Cash Flow
1	€ 765.60	€ 744.00	€ 211.03	€ 1,720.63	€ 28.75	€ -	€ 28.75	€ 27.72	€ (1,691.89)	€ (1,631.52)
2	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 26.73	€ 28.75	€ 26.73
3	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 25.78	€ 28.75	€ 25.78
4	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 24.86	€ 28.75	€ 24.86
5	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.97	€ 28.75	€ 23.97
6	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.12	€ 28.75	€ 23.12
7	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 22.29	€ 28.75	€ 22.29
8	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 21.50	€ 28.75	€ 21.50
9	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 20.73	€ 28.75	€ 20.73
10	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.99	€ 28.75	€ 19.99
11	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.28	€ 28.75	€ 19.28
12	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 18.59	€ 28.75	€ 18.59
13	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.93	€ 28.75	€ 17.93
14	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.29	€ 28.75	€ 17.29
15	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.67	€ 28.75	€ 16.67
16	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.07	€ 28.75	€ 16.07
17	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 15.50	€ 28.75	€ 15.50
18	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.95	€ 28.75	€ 14.95
19	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.41	€ 28.75	€ 14.41
20	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.90	€ 28.75	€ 13.90
21	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.40	€ 28.75	€ 13.40
22	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.93	€ 28.75	€ 12.93
23	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.46	€ 28.75	€ 12.46
24	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.02	€ 28.75	€ 12.02
25	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 11.59	€ 28.75	€ 11.59
Totals	€ 765.60	€ 744.00	€ 211.03	€ 1,720.63	€ 718.67	€ -	€ 718.67	€ 463.67	€ (1,001.97)	€ (1,195.57)

CCAB

Project Lifespan	25	years	
Lending Interest Rate	3.70%		
Surface Area of House	21.1882366	m²	
Wall Insulation Price Price	0.55 for cm thick	per m²	
Price for 5 cm Thickness	€ 2.75	per m²	
Wall Insulation Durability	50	yrs	
Wall Area	145.92	m²	
Wall Area Without Windows	139.2	m²	
Total Wall Insulation Price	€ 382.80		
Windows	6	per house	
Window Area	1.12	m² per window	
Double Glazed Windows Price	95.63	per window	
Double Glazed W. Durability	30	yrs	
Total Double Glazed W. Price	€ 573.78		
Surface Area of Roof	25.42588391	m²	
Roof Insulation Price	8.3	per m²	
Roof Insulation Durability	50	yrs	
Total Roof Insulation Price	€ 211.03		
Adjusted Electricity Bill	€ 20.00	per month	
Heating Contribution to Bill	80%		
Heating Loss from Walls	33%		
Heating Loss from Windows	18%		
Heating Loss from Roof	26%		
Total Heating Lost	25.67%		
Loss in Heating	€ 4.11	per month	
Avrg Wood Consumption	0	m³ per year	
Price of wood	€ 45.00	per m³	
Valued Wood Consumption	€ -	per year	
Avoided Wood Consumption	€ -	per year	
NPV	€ (662.29)		
IRR	-3.67%		
B/C	0.40		

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 382.80	€ 573.78	€ 211.03	€ 1,167.61	€ 28.75	€ -	€ 28.75	€ 27.72	€ (1,138.87)	€ (1,098.23)
2	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 26.73	€ 28.75	€ 26.73
3	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 25.78	€ 28.75	€ 25.78
4	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 24.86	€ 28.75	€ 24.86
5	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.97	€ 28.75	€ 23.97
6	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.12	€ 28.75	€ 23.12
7	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 22.29	€ 28.75	€ 22.29
8	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 21.50	€ 28.75	€ 21.50
9	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 20.73	€ 28.75	€ 20.73
10	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.99	€ 28.75	€ 19.99
11	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.28	€ 28.75	€ 19.28
12	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 18.59	€ 28.75	€ 18.59
13	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.93	€ 28.75	€ 17.93
14	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.29	€ 28.75	€ 17.29
15	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.67	€ 28.75	€ 16.67
16	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.07	€ 28.75	€ 16.07
17	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 15.50	€ 28.75	€ 15.50
18	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.95	€ 28.75	€ 14.95
19	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.41	€ 28.75	€ 14.41
20	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.90	€ 28.75	€ 13.90
21	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.40	€ 28.75	€ 13.40
22	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.93	€ 28.75	€ 12.93
23	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.46	€ 28.75	€ 12.46
24	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.02	€ 28.75	€ 12.02
25	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 11.59	€ 28.75	€ 11.59
Totals	€ 382.80	€ 573.78	€ 211.03	€ 1,167.61	€ 718.67	€ -	€ 718.67	€ 463.67	€ (448.95)	€ (662.29)

CCBA

Project Lifespan	25	years	
Lending Interest Rate	3.70%		
Surface Area of House	21.1882366	m²	
Wall Insulation Price Price	0.55 for cm thick	per m²	
Price for 10 cm Thickness	€ 5.50	per m²	
Wall Insulation Durability	50	yrs	
Wall Area	145.92	m²	
Wall Area Without Windows	139.2	m²	
Total Wall Insulation Price	€ 765.60		
Windows	6	per house	
Window Area	1.12	m² per window	
Double Glazed Windows Price	95.63	per window	
Double Glazed W. Durability	30	yrs	
Total Double Glazed W. Price	€ 573.78		
Surface Area of Roof	25.42588391	m²	
Roof Insulation Price	8.3	per m²	
Roof Insulation Durability	50	yrs	
Total Roof Insulation Price	€ 211.03		
Adjusted Electricity Bill	€ 20.00	per month	
Heating Contribution to Bill	80%		
Heating Loss from Walls	33%		
Heating Loss from Windows	18%		
Heating Loss from Roof	26%		
Total Heating Lost	25.67%		
Loss in Heating	€ 4.11	per month	
Avrg Wood Consumption	0	m³ per year	
Price of wood	€ 45.00	per m³	
Valued Wood Consumption	€ -	per year	
Avoided Wood Consumption	€ -	per year	
NPV	€ (1,031.43)		
IRR	-5.55%		
B/C	0.30		

Year	Wall Insulation Cost	Window Replacement Cost	Roof Insulation Cost	Total Cost	Electricity Benefit	Wood Benefit	Total Benefits	Discounted Benefit	Cash Flow	Discounted Cash Flow
1	€ 765.60	€ 573.78	€ 211.03	€ 1,550.41	€ 28.75	€ -	€ 28.75	€ 27.72	€ (1,521.67)	€ (1,467.38)
2	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 26.73	€ 28.75	€ 26.73
3	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 25.78	€ 28.75	€ 25.78
4	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 24.86	€ 28.75	€ 24.86
5	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.97	€ 28.75	€ 23.97
6	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 23.12	€ 28.75	€ 23.12
7	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 22.29	€ 28.75	€ 22.29
8	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 21.50	€ 28.75	€ 21.50
9	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 20.73	€ 28.75	€ 20.73
10	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.99	€ 28.75	€ 19.99
11	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 19.28	€ 28.75	€ 19.28
12	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 18.59	€ 28.75	€ 18.59
13	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.93	€ 28.75	€ 17.93
14	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 17.29	€ 28.75	€ 17.29
15	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.67	€ 28.75	€ 16.67
16	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 16.07	€ 28.75	€ 16.07
17	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 15.50	€ 28.75	€ 15.50
18	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.95	€ 28.75	€ 14.95
19	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 14.41	€ 28.75	€ 14.41
20	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.90	€ 28.75	€ 13.90
21	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 13.40	€ 28.75	€ 13.40
22	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.93	€ 28.75	€ 12.93
23	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.46	€ 28.75	€ 12.46
24	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 12.02	€ 28.75	€ 12.02
25	€ -	€ -	€ -	€ -	€ 28.75	€ -	€ 28.75	€ 11.59	€ 28.75	€ 11.59
Totals	€ 765.60	€ 573.78	€ 211.03	€ 1,550.41	€ 718.67	€ -	€ 718.67	€ 463.67	€ (831.75)	€ (1,031.43)

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